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DISEASES OF PLANTS IN THE UNITED STATES IN 1931

Compiled by

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INTRODUCTION

The value of the annual summaries of plant diseases prepared by the Plant Disease Survey is to a certain extent cumulative, since a comparison of different years is one of the chief points of interest. It is important, therefore, to have the information on diseases of different years readily comparable. To facilitate this we have endeavored to have the "Plant Diseases in the United States for 1931" follow closely in form and arrangement the preceding summaries.

Information already published in the Plant Disease Reporter is not repeated but in some cases is referred to by "P. D. R. --, Page ---." There are, of course, numerous notes regarding the occurrence of plant diseases in the Reporter which are not referred to in this summary. Anyone wishing information regarding a particular disease or host should consult the index to the Reporter. As is probably well known many notes of occurrence of diseases are received each year by the Plant Disease Survey which cannot be mentioned in the Reporter or the Summary. Any pathologist planning to publish on the distribution of a specific disease in the United States would do well to consult our files. So far as is practical we are always glad to prepare summaries or maps giving the known distribution of a disease.

As individual contributions cannot be acknowledged without undue use of space, a list of collaborators is given below. Continued contacts with plant pathologists throughout the United States both personally and by letter is one of the pleasantest features in the work of the Plant Disease Survey.

N. E. S.

LIST OF COLLABORATORS FOR THE YEAR 1931

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ARIZONA, Box 15, University Station, Tucson - J. G. Brown.
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South Branch University of California, Los Angeles - O. A. Plunkett.
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DELAWARE, Agricultural Experiment Station, Newark - J. E. Adams, Thomas F. Manns.

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INDIANA, Agricultural Experiment Station, M. W. Gardner, J. A. McClintock, R. W. Samson.
Purdue University, Lafayette - C. L. Porter.

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Iowa State College, Ames - J. C. Gilman, R. H. Porter.
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KENTUCKY, Agricultural Experiment Station, Lexington - W. D. Valleau.
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College of Agriculture, Lexington - Russell A. Hunt.

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Agricultural Experiment Station, St. Paul - Louise Dosdall, E. M. Freeman, E. C. Stakman.

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NEBRASKA, College of Agriculture, Lincoln - G. L. Peltier, R. W. Goss.

NEVADA, Agricultural Experiment Station, Reno - P. A. Lehenbauer.

NEW HAMPSHIRE, Agricultural Experiment Station, Durham - O. R. Butler.
Dartmouth College, Hanover - A. H. Chivers.

NEW JERSEY, Agricultural Experiment Station, New Brunswick - W. H. Martin, R. P. White.
Pemberton - Thompson J. Blisard.
Rutgers College, New Brunswick - C. M. Haenseler.

NEW MEXICO, New Mexico Agricultural College, State College - R. F. Crawford.

NEW YORK, Cornell University, Ithaca - C. Chupp, H. H. Whetzel, M. F. Barrus.
Agricultural Experiment Station, Ithaca - F. M. Blodgett, L. M. Massey.
Agricultural Experiment Station, Geneva - W. H. Rankin.
College of Agriculture, Ithaca - H. M. Fitzpatrick.

NORTH CAROLINA, Agricultural Experiment Station, Raleigh - R. F. Poole, S. G. Lehman.

NORTH DAKOTA, State College Station, Fargo - H. L. Bolley, W. E. Brentzel.

OHIO, Agricultural Experiment Station, Wooster - H. C. Young, Fredericka Detmers, Custis May, R. C. Thomas, P. E. Tilford.
University of Cincinnati, Cincinnati - O. T. Wilson.
Ohio State University, Columbus - A. L. Pierstorff.

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A. & Mech. College, Stillwater - R. Stratton.

OREGON, Oregon Agricultural College, Corvallis - H. P. Barss.
Hood River Company, Hood River - LeRoy Childs.
Agricultural Experiment Station, Corvallis - S. M. Zeller.

PENNSYLVANIA, Agricultural Experiment Station, State College - F. D. Kern, E. L. Nixon.
Pennsylvania State College, State College - R. S. Kirby, L. O. Overholts, H. W. Thurston, G. L. Zundel.
Pennsylvania Field Laboratory, Bustleton - W. S. Beach.

RHODE ISLAND, Rhode Island State College, Kingston - H. W. Browning.
Brown University, Providence - Walter H. Snell.

SOUTH CAROLINA, Agricultural Experiment Station, Clemson College - G. M. Armstrong, H. W. Barre, G. A. Meckstroth.
South Carolina Agricultural College, Clemson College - D. B. Rosenkrans.
Wofford College, Spartanburg - C. B. Waller.

SOUTH DAKOTA, South Dakota State College, Brookings - E. A. Walker.
Northville - J. F. Brenckle.

TENNESSEE, Agricultural Experiment Station, Knoxville - C. D. Sherbakoff, S. H. Essary.
University of Tennessee, Knoxville - J. O. Andes, J. L. Baskin, L. R. Hesler.
Tennessee Horticultural Society, Knoxville - N. D. Peacock.

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Sub-Station No. 15, Weslaco - W. J. Bach.
Sub-Station No. 15, Temple - B. F. Dana.

TEXAS, (Cont.) Prairie View Normal, Prairie View - G. H. Dickerson.
Temple Substation, Temple - Colonel Hoyt Rogers.

UTAH, Utah Agricultural College, Logan - B. L. Richards.

VERMONT, Agricultural Experiment Station, Burlington - B. F. Lutman.

VIRGINIA, Agricultural Experiment Station, Blacksburg - S. A. Wingard, R. G. Henderson, A. B. Massey, James Godkin.
Virginia Truck Experiment Station, Norfolk - H. T. Cook.
Field Laboratory, Winchester - A. B. Groves.
Field Laboratory, Staunton - R. H. Hurt.
Hampton Institute, Hampton - T. W. Turner.

WASHINGTON, Agricultural Experiment Station, Pullman - F. D. Heald.
Long Beach - D. J. Crowley.
Washington State College, Pullman - L. K. Jones.

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Agricultural Experiment Station, Morgantown - Anthony Berg, E. C. Sherwood.
Agricultural Experiment Station, Inwood - F. J. Schneiderhan.

WISCONSIN, Agricultural Experiment Station, Madison - L. R. Jones.
University of Wisconsin, Madison - G. W. Keitt, A. J. Riker, R. E. Vaughan.

WYOMING, Agricultural Experiment Station, Laramie - Aven Nelson.

HAITI, Port au Prince, Haiti - H. D. Barker.

HAWAII, University of Hawaii, Honolulu - G. H. Godfrey, C. P. Sideris.
Pineapple Experiment Station, Honolulu - M. B. Linford.

PHILLIPPINE ISLANDS, Bureau of Science, Manila - C. J. Humphrey.

PORTO RICO, Insular Experiment Station, Rio Piedras - M. T. Cook, J. A. B. Nolla.

METHOD OF PRESENTING WEATHER DATA

So important are weather conditions in the incidence of plant diseases that some review of the weather must accompany any plant disease summary, yet for an area so large as the United States only the most generalized statement can be presented in any reasonable space. In an endeavor to present in small compass certain salient facts regarding the weather of 1931 a series of maps has been prepared showing the deviation from the normal of mean temperature and total precipitation. (Figs. 1 - 8).

For convenience the climatic regions used by the Weather Bureau have been utilized, although these are political, that is, limited by State boundaries, rather than natural climatic units. The seasons have been considered arbitrarily as consisting of three calendar months, although the duration of the periods of growth and dormancy vary greatly in different parts of the United States. Mean temperature and total rainfall are given in percentages of normal, regions approximately normal and above being further indicated by shading. Deviation from the normal probably furnishes one of the best means of correlating weather with the unusual crop or disease conditions, since obviously "normal" indicates an average of the conditions to which the crops of the region have been subject during a series of years.

In addition to these general maps, the accumulated rainfall and temperature for six selected stations is indicated by means of graphs. (Figs. 9 - 20) In each case the normal for the station is indicated by a solid line and the actual for 1931 by a broken line.

THE WEATHER IN 1931

While there was in 1931, of course, no single outstanding feature comparable to the drought of 1930, it is evident that a large part of the United States suffered from deficient rainfall in 1931. This is particularly true of the Plains States and the southeastern States. Spring temperatures were somewhat below normal in the southeastern United States while summer temperatures were nearly normal or somewhat above normal throughout the country, and fall temperatures well above normal in all the States east of the Rocky Mountains.

The individual stations for which detailed records are given were selected by J. B. Kincer, Senior Meteorologist of the Weather Bureau, as being fairly representative of the various sections of the country. With the exception of Bismarck, North Dakota, precipitation was somewhat below normal in all these centers throughout the growing season, and at Atlanta, Georgia, was decidedly below normal. Temperatures, on the other hand, were nearly normal at Harrisburg, Pennsylvania; Little Rock, Arkansas; and Atlanta, Georgia; slightly above normal at Sacramento, California; and well above normal at Portland, Oregon, and Bismarck, North Dakota.

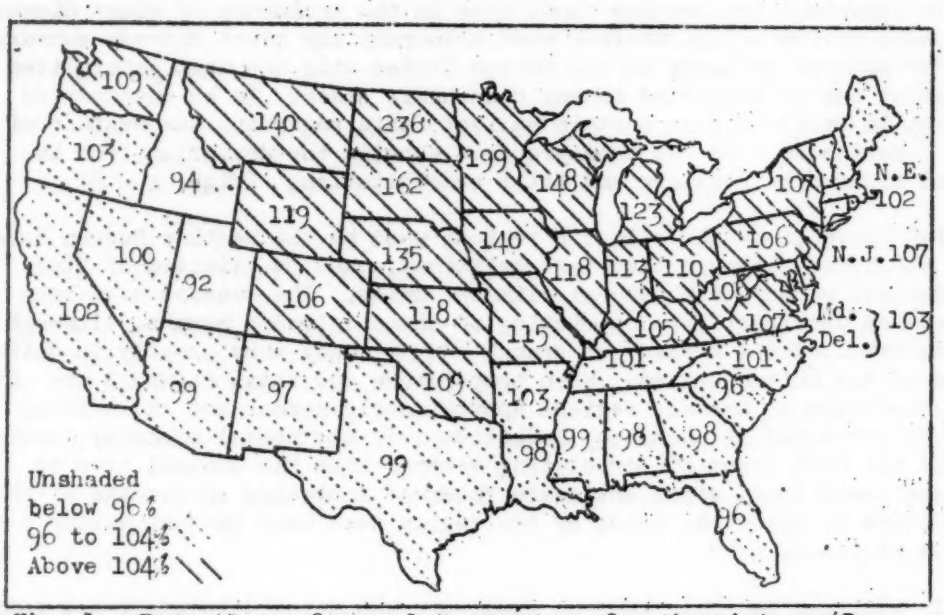

Fig. 1. Percentage of normal temperature for the winter (Dec. 1930, Jan. - Feb. 1931) 1931.

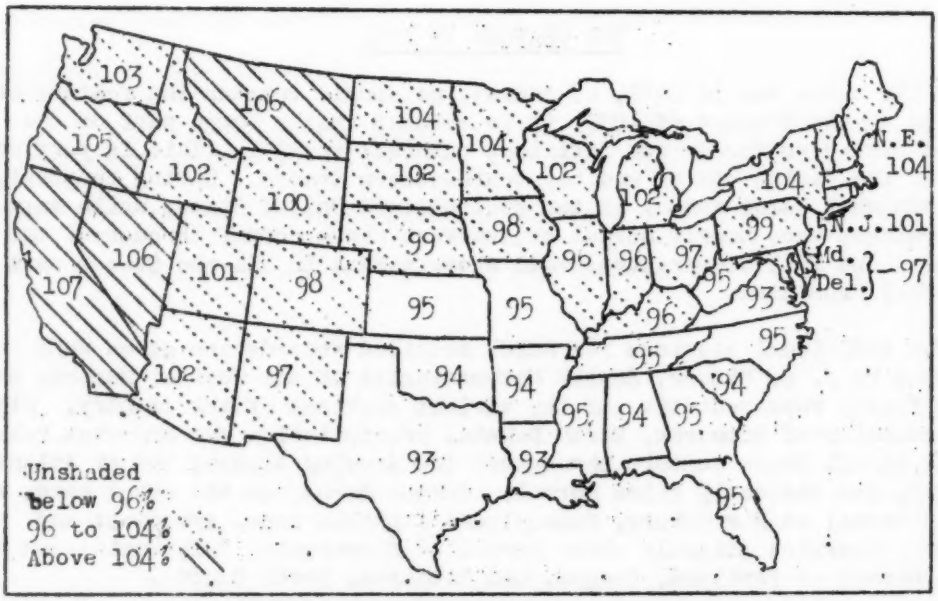

Fig. 2. Percentage of normal temperature for spring (Mar. April, May) 1931.

TEMPERATURE

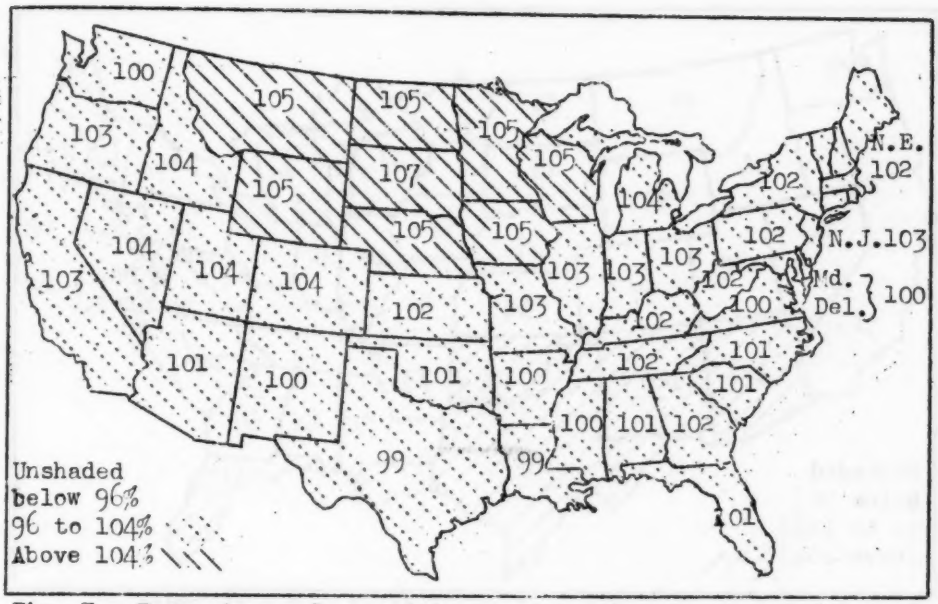

Fig. 3. Percentage of normal temperature for the summer (June July, Aug.) 1931.

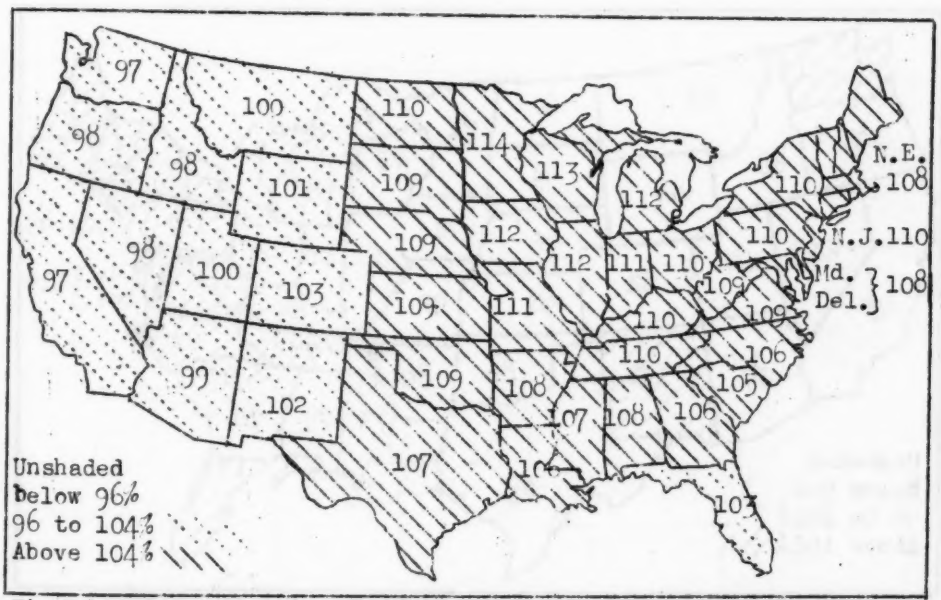

Fig. 4. Percentage of normal temperature for the fall (Sept., Oct., Nov.) 1931.

PRECIPITATION

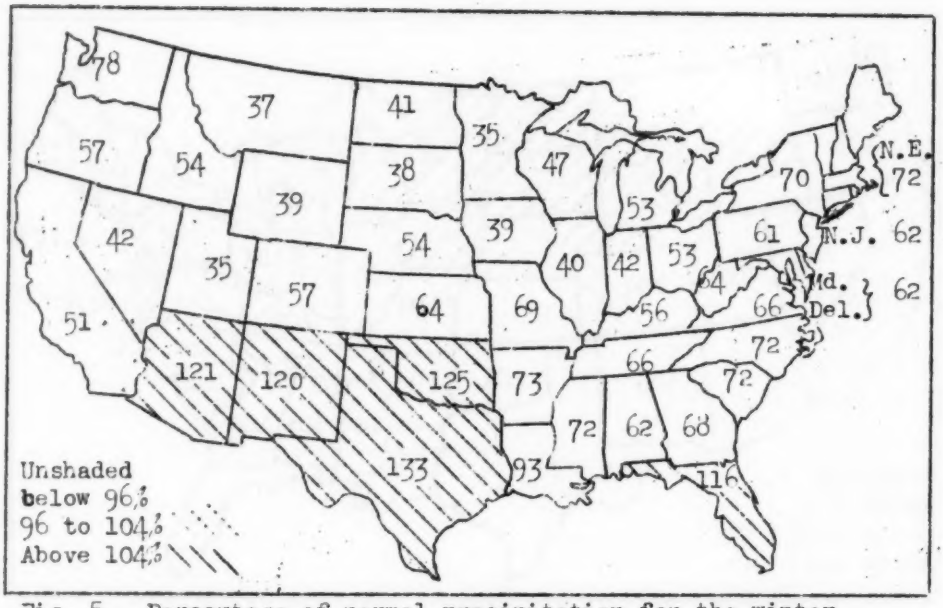

Fig. 5. Percentage of normal precipitation for the winter (Dec. 1930, Jan. - Feb. 1931) 1931.

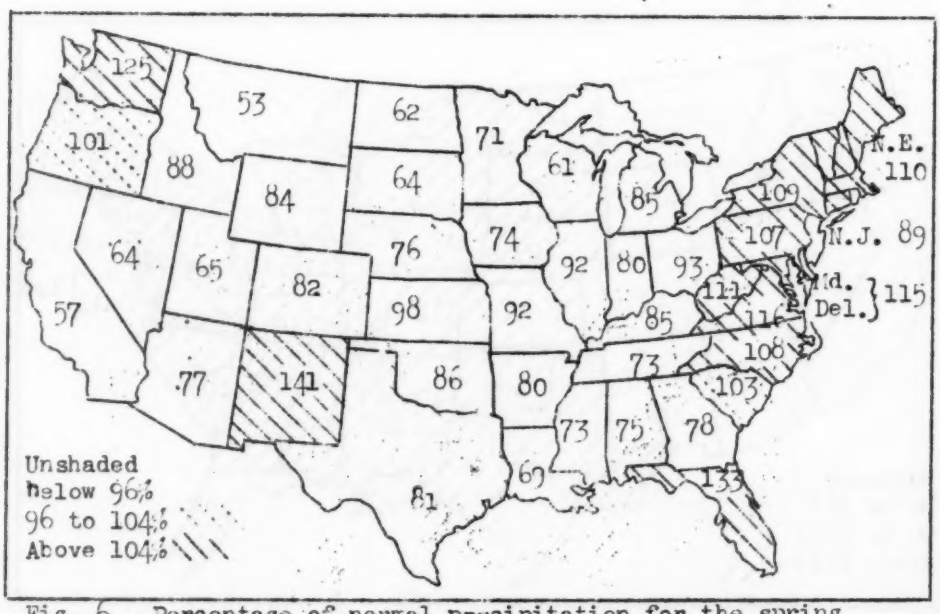

Fig. 6. Percentage of normal precipitation for the spring (Mar., Apr., May) 1931.

PRECIPITATION

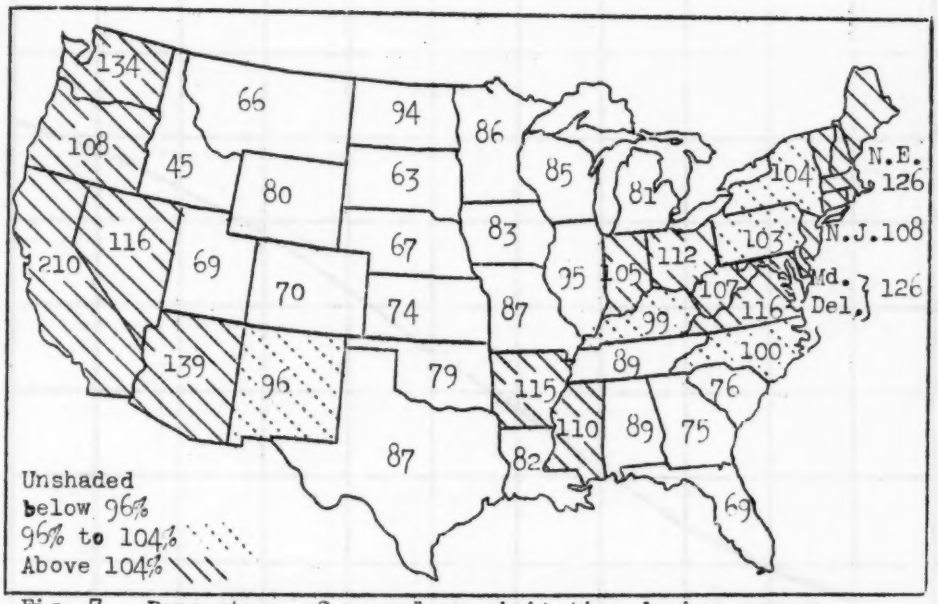

Fig. 7. Percentage of normal precipitation during summer (June, July, Aug.) 1931.

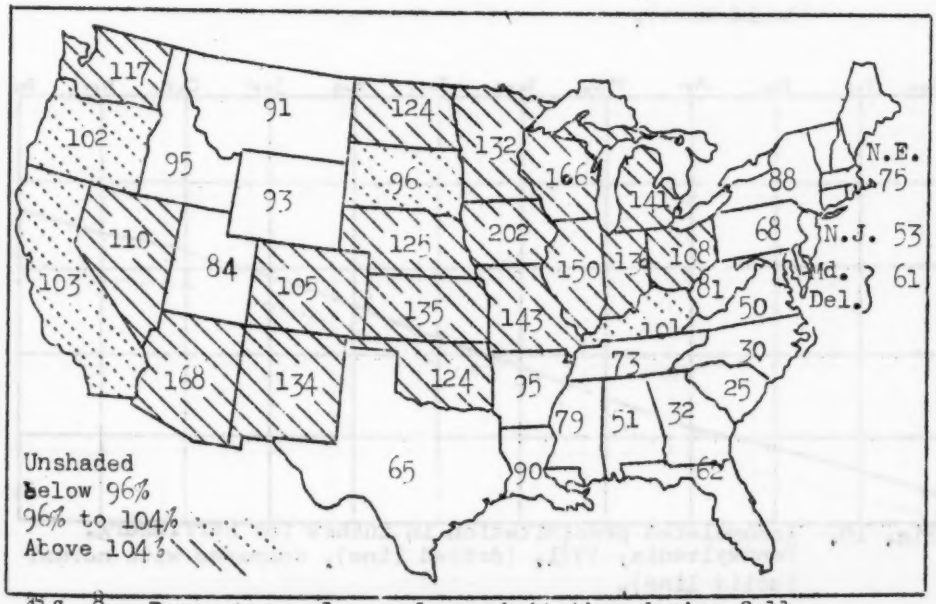

Fig. 8. Percentage of normal precipitation during fall (Sept., Oct., Nov.) 1931.

HARRISBURG, PENNSYLVANIA

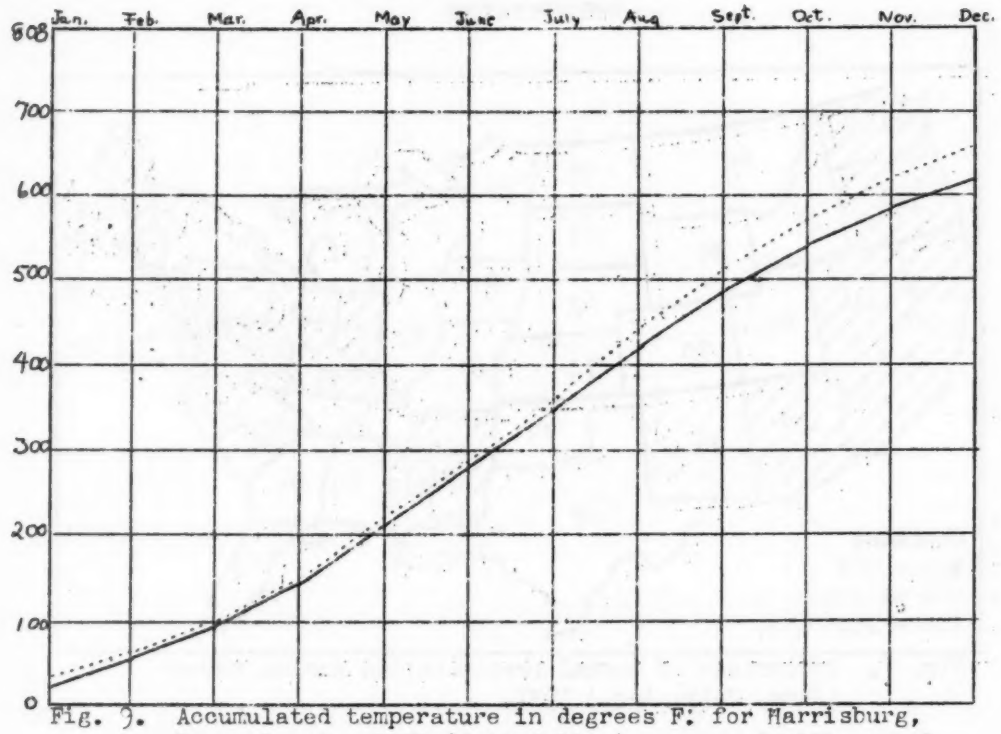

Fig. 9. Accumulated temperature in degrees F. for Harrisburg, Pennsylvania, 1931 (dotted line), compared with normal (solid line).

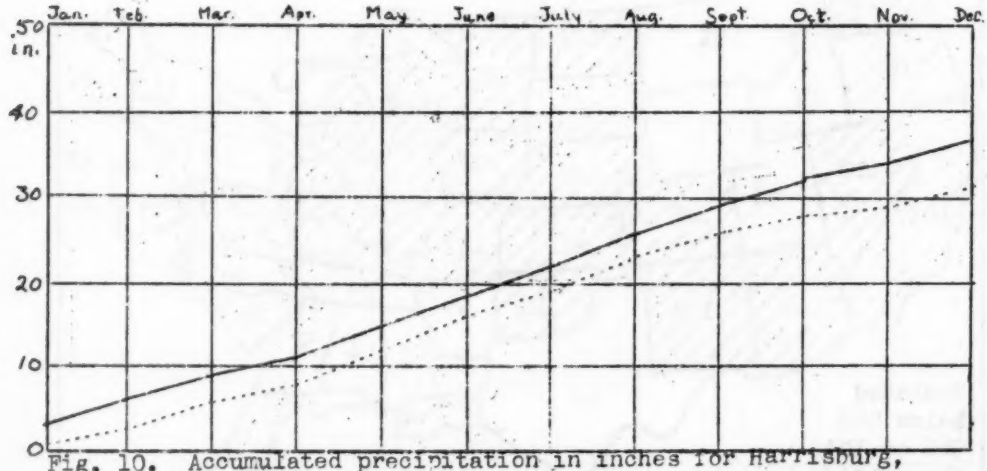

Fig. 10. Accumulated precipitation in inches for Harrisburg, Pennsylvania, 1931, (dotted line), compared with normal (solid line).

ATLANTA, GEORGIA

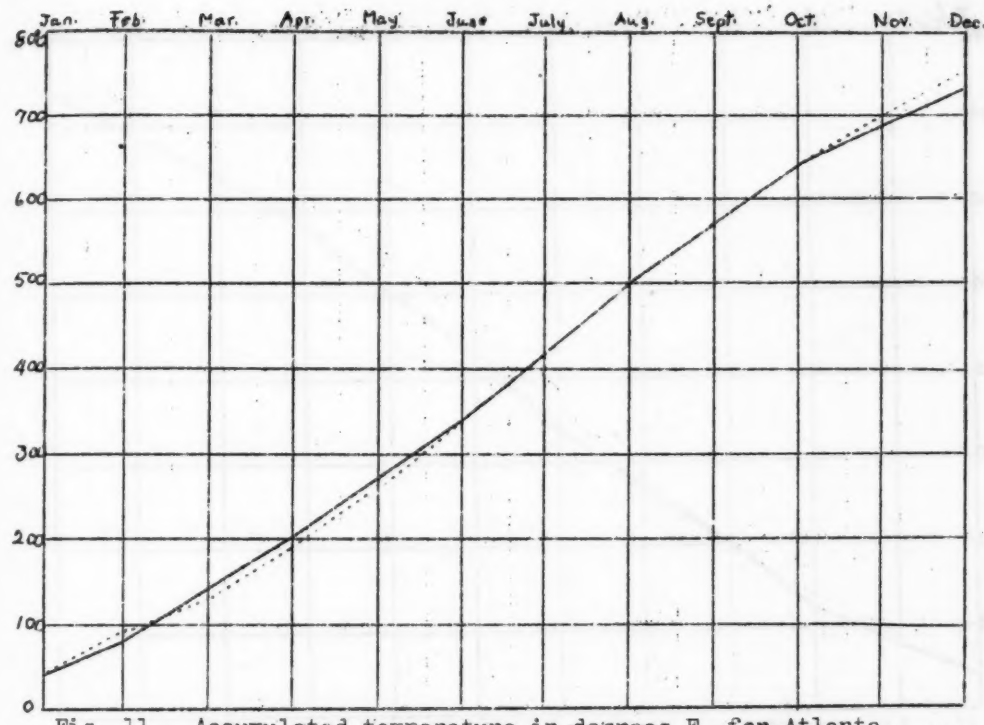

Fig. 11. Accumulated temperature in degrees F. for Atlanta, Georgia, 1931, (dotted line), compared with normal (solid line).

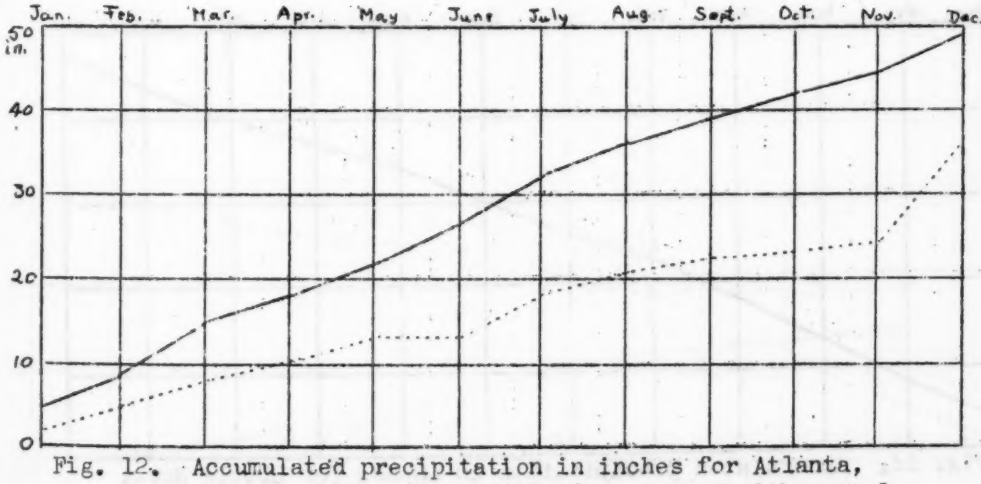

Fig. 12. Accumulated precipitation in inches for Atlanta, Georgia, 1931, (dotted line), compared with normal (solid line).

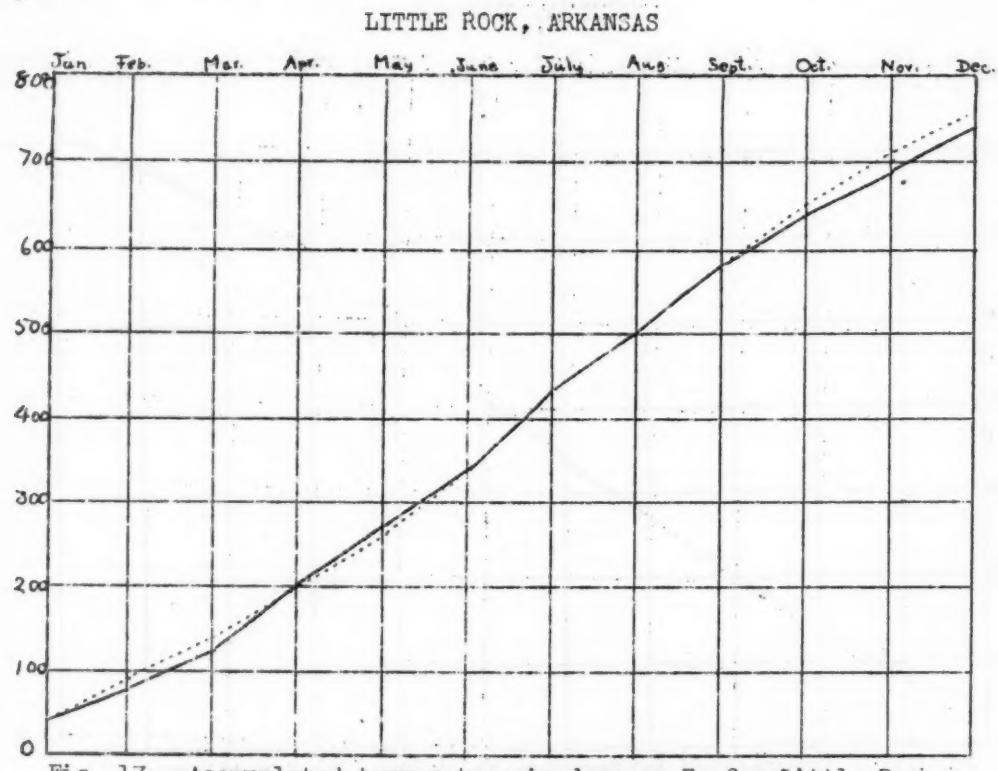

Fig. 13. Accumulated temperature in degrees F. for Little Rock, Arkansas, 1931, (dotted line), compared with normal (solid line).

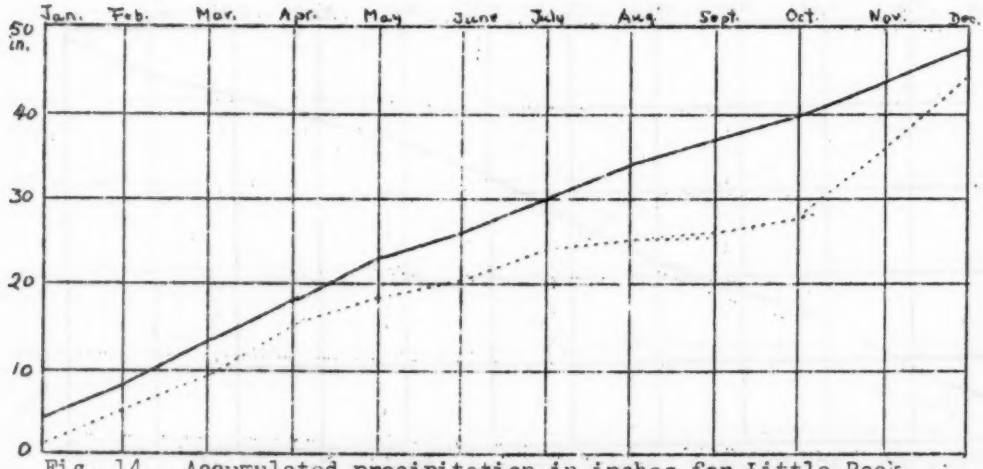

Fig. 14. Accumulated precipitation in inches for Little Rock, Arkansas, 1931, (dotted line), compared with normal (solid line).

BISMARCK, NORTH DAKOTA

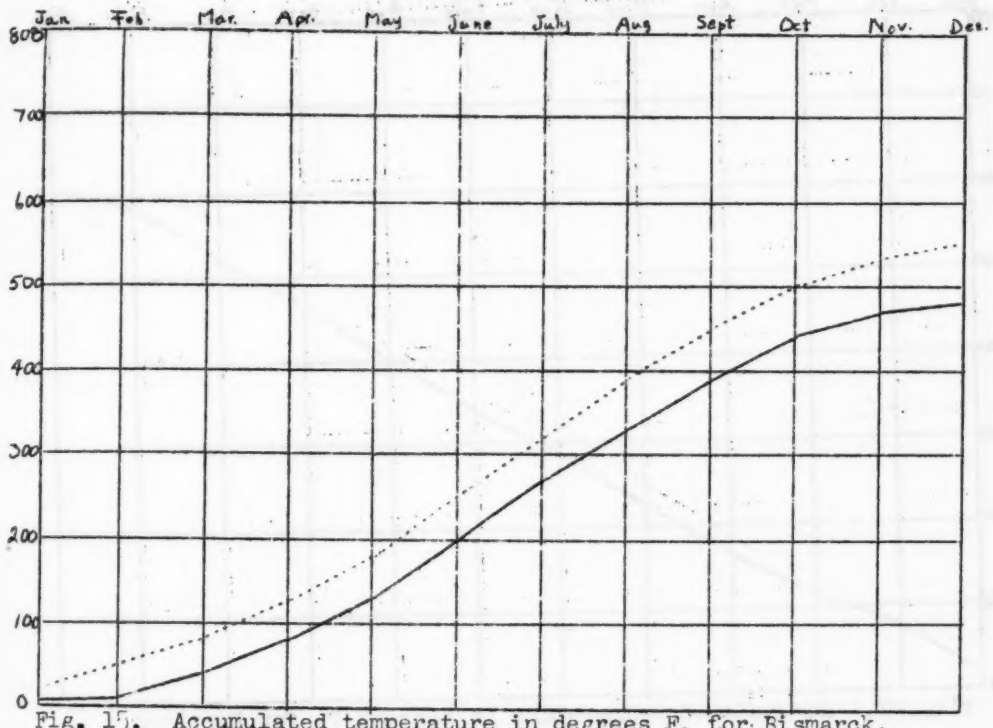

Fig. 15. Accumulated temperature in degrees F. for Bismarck, North Dakota, 1931, (dotted line), compared with normal (solid line).

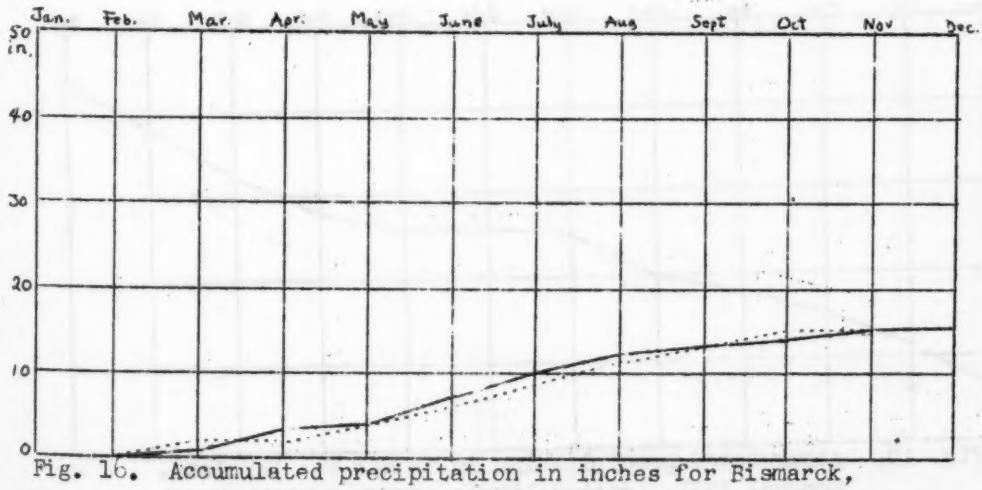

Fig. 16. Accumulated precipitation in inches for Bismarck, North Dakota, 1931, (dotted line), compared with normal (solid line).

PORTLAND, OREGON

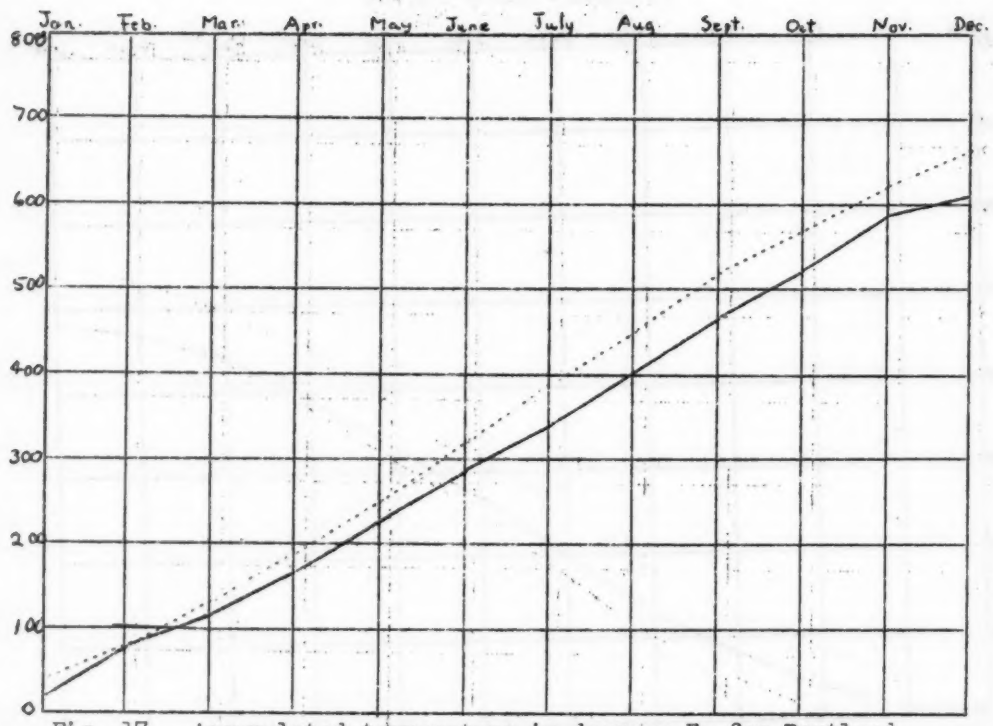

Fig. 17. Accumulated temperature in degrees F. for Portland, Oregon, 1931, (dotted line), compared with normal (solid line).

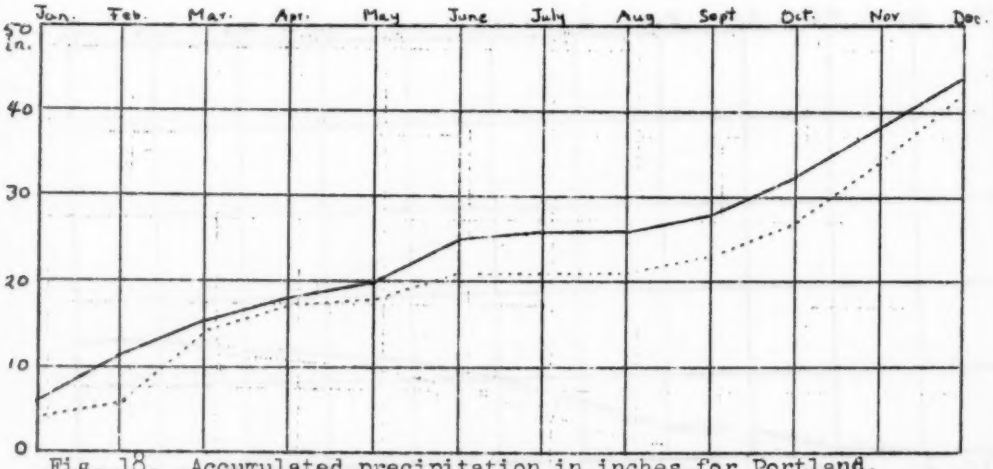

Fig. 18. Accumulated precipitation in inches for Portland, Oregon, 1931, (dotted line), compared with normal (solid line).

SACRAMENTO, CALIFORNIA

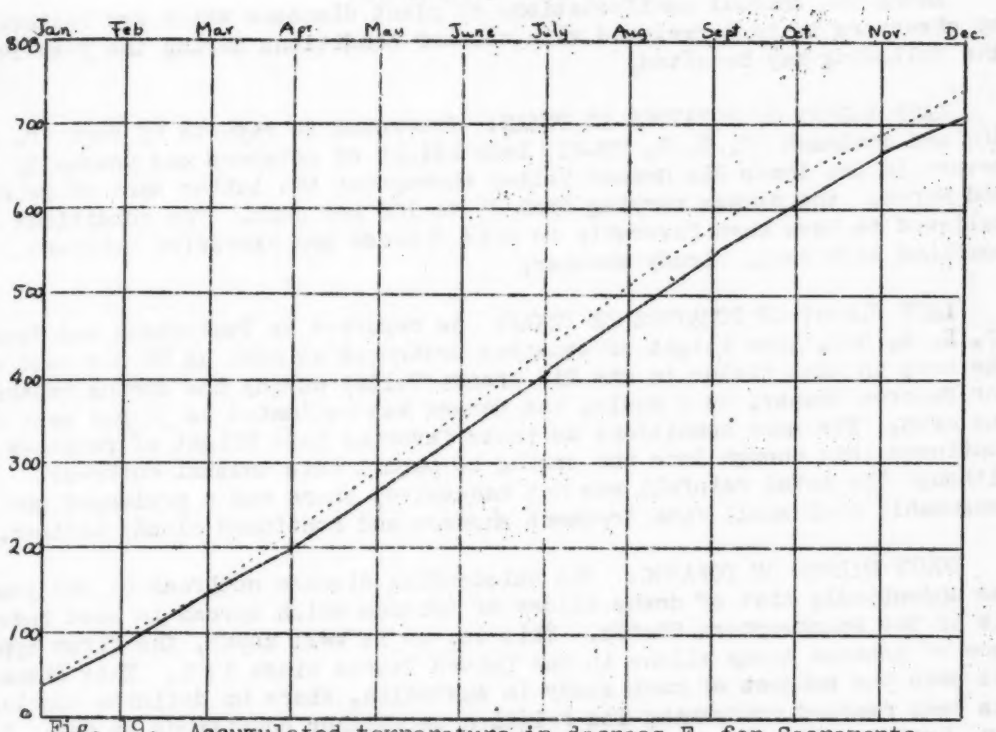

Fig. 19. Accumulated temperature in degrees F. for Sacramento, California, 1931, (dotted line), compared with normal (solid line).

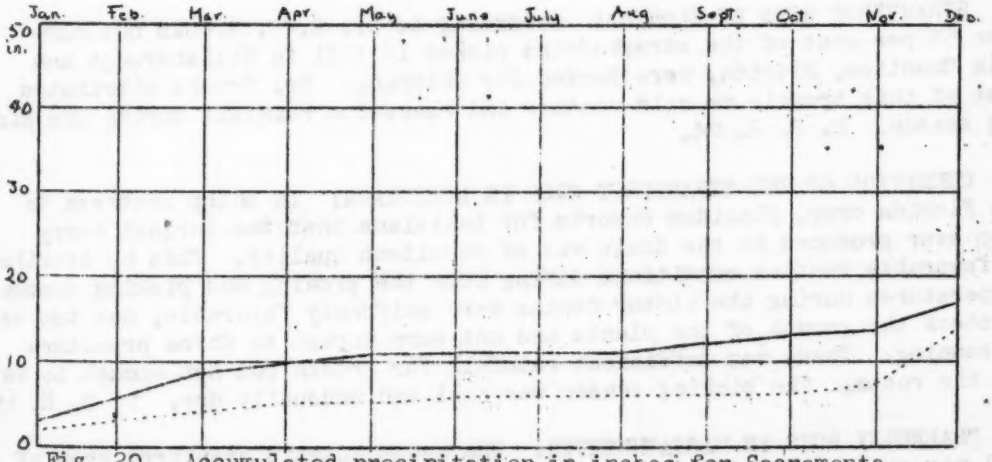

Fig. 20. Accumulated precipitation in inches for Sacramento, California, 1931, (dotted line), compared with normal (solid line).

WEATHER AND DISEASE

Among the unusual manifestations of plant diseases which are believed by observers to be correlated with weather conditions during the year 1931, the following may be cited.

LATE BLIGHT OF POTATOES IN TEXAS: According to reports by Bach (P. D. R. 46) and Stalmach (P. D. R. 20-21) late blight of potatoes was unusually severe in the lower Rio Grande Valley throughout the latter part of February and March, the damage varying from 25 to 100 per cent. The conditions believed to have been favorable to this disease are excessive moisture combined with cool, cloudy weather.

LATE BLIGHT OF TOMATOES IN TEXAS: As reported by Taubenhaus and Ezekiel (P. D. R. 54), late blight of tomatoes destroyed as much as 80 per cent of the crop in some fields in the Rio Grande Valley during the spring months. For Cameron County, as a whole, the damage was estimated as 50 per cent of the crop. The same conditions as those favoring late blight of potatoes continued long enough into the spring to permit this unusual outbreak. Although the total rainfall was not excessive, there was a prolonged unseasonable cool spell with frequent showers and continued cloudy weather.

DOWNY MILDEW OF TOBACCO: The outstanding disease outbreak of the year was undoubtedly that of downy mildew of tobacco which spread to seed beds in six of the southeastern States. This is, as is well known, the first appearance of tobacco downy mildew in the United States since 1921. This disease has been the subject of much study in Australia, where no definite conclusion has been reached concerning its relation to weather conditions as yet. It may, however, be pointed out that throughout the regions affected in 1931, temperatures averaged somewhat below normal during the period in which the tobacco is in the seed beds. P. D. R. 32, 43, 57, and 168.

STRAWBERRY ROTS IN FLORIDA: According to Dr. A. N. Brooks not more than 50 per cent of the strawberries picked in 1931 in Hillsborough and Polk Counties, Florida, were packed for shipping. Dr. Brooks attributes most of this trouble to cold weather and excessive rainfall during the picking season. P. D. R. 24.

CONDITION OF THE STRAWBERRY CROP IN LOUISIANA: In sharp contrast to the Florida crop, Plakidas reports for Louisiana that the largest berry crop ever produced in the State was of excellent quality. This he attributes to favorable weather conditions during both the growing and picking seasons. Temperatures during the winter months were uniformly favorable, not too cold to check the growth of the plants and not warm enough to force premature blossoming. There was sufficient rainfall for growth but not enough to waterlog the roots. The picking season was cool and unusually dry. P. D. R. 65.

CRANBERRY ROTS IN MASSACHUSETTS: The Massachusetts cranberry crop of 1931 was characterized by losses from decay greater than any year since 1914, and perhaps the greatest in the history of the industry. Experienced observers estimate that over 20 per cent of the berries harvested decayed before they reached the consumer. This condition is believed to be correlated with abnormally high spring temperatures, relatively low summer temperatures, and high summer rainfall.

DISEASES OF CEREAL CROPS

WHEAT

STINKING SMUT (Tilletia levis and T. tritici). Percentage losses from stinking smut were reported as follows: 8 in Maryland; 5 in Montana; 3, Virginia and South Dakota; 2, Pennsylvania, North Dakota, and Kansas; 1.5, Ohio and Minnesota; 1, Texas and Wisconsin; 0.5, Delaware and Michigan; traces in New York, West Virginia, North Carolina, Arkansas, Indiana, Missouri, and Colorado. Except in Montana and Maryland, they were about the same as or somewhat less than for the past few years. In Montana the loss of 5 per cent was considerably more than usual and has only been equalled once before, in 1927. In Maryland the total loss of 8 per cent was unusually high but the 3 per cent reduction in yield was about the normal. Considerable decrease in loss as compared to last year was observed in Minnesota, Michigan, Colorado, and North Carolina. In Kansas, according to E. H. Leker, there was less smut in the north central counties but more in the south central part where seed treatment has been falling off due to light losses for several years.

A 2 per cent infection of T. tritici occurred in one area of a field of Forward wheat in New York, where this species is rather uncommon.

The results, compiled by J. A. Faris, of a survey conducted during 1931 in parts of Minnesota, Iowa, North and South Dakota, Nebraska, Montana, Utah, and Idaho are given in the Reporter, vol. 16, no. 6, pp. 56-67; May 1, 1932. Other reports are quoted in Plant Disease Reporter 15: 68, 90 (survey in Pennsylvania), 130-131 (survey in Maryland).

LOOSE SMUT (Ustilago tritici) was about normal in prevalence. In Minnesota there was more than for the past two years when there had been less than usual. In Missouri just the opposite condition was reported. Losses in West Virginia and Maryland were somewhat less than usual, otherwise there was not much variation from the normal. Estimates were 2 per cent in Georgia, Texas, and Missouri; 1.5 in South Dakota; 1, New York, Virginia, Ohio, Wisconsin, and Minnesota; 0.5, Maryland, North Dakota, and Montana; 0.1 to trace in Delaware, West Virginia, North Carolina, Arkansas, Indiana, Michigan, and Colorado. P. D. R. 15: 68.

FLAG SMUT (Urocystis tritici) was reported from Kansas, Illinois, and Missouri in 1931. According to J. A. Faris there was some extension of its range in Kansas. In small local areas there was as much as 50 per cent infection in a few fields, but the usual amount ranged from a trace to 6 per cent. P. D. R. 15: 51, 130.

STEM RUST (Puccinia graminis), caused very little damage in 1931. Only four States reported 1 per cent or more, including Texas, 2 per cent; Ohio, 1.5 per cent; and Virginia and Minnesota, 1 per cent. Dry weather and late appearance of the rust are mentioned by collaborators in explanation of the small losses. I. T. Scott remarked, "If most infections in Missouri are from uredinospores the percentage of infection should have been greater this season as the winter was the mildest in years and thus should have been favorable for overwintering of uredinospores. Since the barberry is rare in Missouri, it is thought that infection from aeciospores is negligible."

C. O. Johnston stated that in Kansas "Rust did not appear until very late except in isolated spots. Just before harvest infection was very heavy in the north central counties." Heat and drought in western and northern Nebraska confined stem rust development largely to the southeastern part of the State, according to M. E. Yount. A survey in that section immediately preceding harvest showed infection ranging from a trace to 30 per cent with 100 per cent in some isolated fields.

LEAF RUST (Puccinia triticina) was generally more important than stem rust and caused moderate to heavy loss in a number of States. In Indiana, according to R. M. Caldwell, the disease was present throughout the winter, and heavy and frequent dews favored its development during the growing season so that it caused a loss of 12 per cent. Most collaborators, however, reported that dry weather prevented its appearance in quantity sufficient to cause much damage until late. Valleau stated that leaf rust was of very little importance in Kentucky and remarked that "Perhaps the abundance of mildew affected its development." Losses reported, besides that in Indiana, of 1 per cent or more were 5 per cent in Virginia, 3, North Carolina; 2, New York and Kansas; 1.5, Ohio; 1, Texas. P. D. R. 15: 68, 108.

SCAB (Gibberella saubinetii), was mostly of slight importance or negligible in 1931. In Iowa it was said to be prevalent and destructive on spring wheat but not on winter wheat (P.D. R. 15: 108). Eight States reported it to be less or much less damaging than usual; no State reported it to be more so. One per cent loss occurred in Maryland, Texas, and Ohio; all other losses reported were less. P.D.R. 15: 68, 108.

GLUME BLOTCH (Septoria nodorum) and SPECKLED LEAF BLOTCH (S. tritici). The glume blotch caused appreciable loss in some States, estimated at 3 per cent (0.5 reduction in yield) in Maryland; 2 per cent in West Virginia; 1 per cent in North Carolina; 0.5 per cent in New York. Barrus reported that "In some fields (in New York) it appeared to be present on every head and every spikelet but even in such cases, the grain seemed to be well filled so that the loss must be small." In North Carolina, according to Poole, "This disease was widely distributed and was abundant on sandy soils where the plants were low in vitality and on very fertile soils where growth was rank."

Melchers reported that the leaf spot is steadily becoming more prevalent and causing greater damage in Kansas. It was also reported from Indiana.

LEAF SPOT (Helminthosporium sativum). North Carolina, and Michigan. A loss of 1 per cent was estimated in North Carolina where the disease seemed to be widespread.

BASAL GLUME ROT (Bacterium atrofaciens). Arkansas. P.D.R. 15: 69.

BLACK CHAFF (Bacterium translucens undulosum). Arkansas and Indiana, on the variety Hope and its hybrids; Wisconsin, also on Hope; Minnesota; Iowa, prevalent on spring wheat in Hancock County, present on at least 20 per cent of the heads in one field. P.D.R. 15: 110.

POWDERY MILDEW (Erysiphe graminis), was reported from several States but was not important. Valleau stated that "For the first time in twelve years has mildew been even noticeable on wheat. This year the blades were

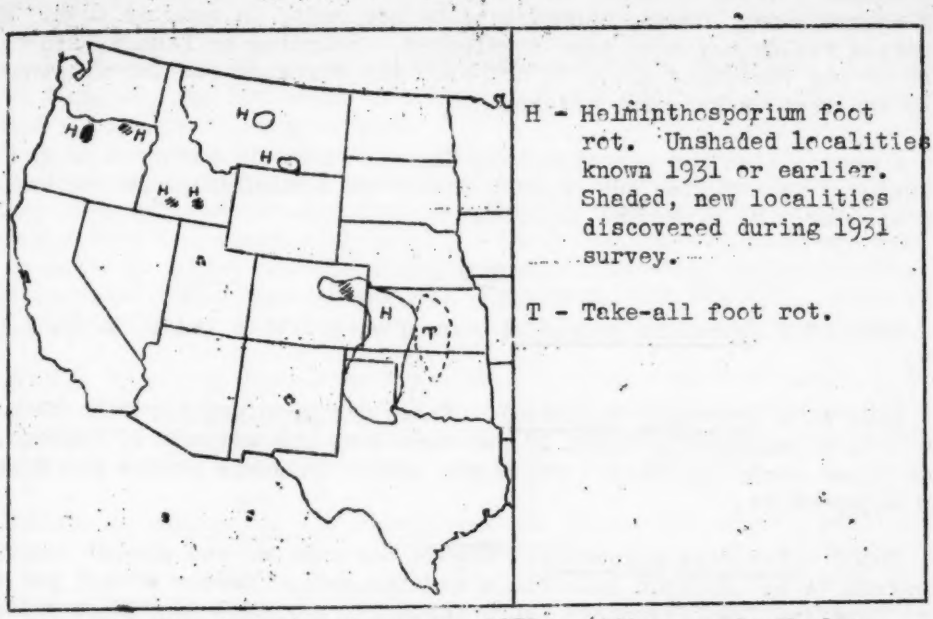
H - Helminthosporium foot rot. Unshaded localities known 1931 or earlier. Shaded, new localities discovered during 1931 survey.
T - Take-all foot rot.

Fig. 21. Wheat foot rot survey, 1931. (After map by Hurley Fellows).

destroyed about one-third of the way up the plant in numerous fields." P. D. R. 15: 49, 52, 68.

BLIGHT, due to Fusarium sp. (not Gibberella saubinetii) and low temperatures occurred in Whitman County, Washington.

FOOT AND ROOT ROTS. TAKE-ALL (Ophiobolus graminis) caused a loss estimated at 1 to 2 per cent in New York and was also reported from Kansas. (See map Fig. 21).

HELMINTHOSPORIUM FOOT ROT (H. sativum) was reported from Ohio, Wisconsin, Minnesota, Texas, Kansas, Montana, and Colorado. During a survey in winter wheat areas west of the Mississippi, it was found in new localities in Colorado, Idaho, and Oregon, according to Hurley Fellows (see map Fig. 21). L. W. Boyle stated that at the time of the survey in Kansas, June 14 to 20, "A timely rain following a drought period seemed to have checked its development. This may be temporary, and the loss will be dependent on later conditions. Where infections had become well developed in the crown there was little apparent benefit from the rain." A loss of 5 per cent was reported from Colorado.

FOOT ROT due to Fusarium spp. was reported from Michigan and Minnesota. In the latter State Fusarium and Helminthosporium together caused a loss of 1 per cent.

WINTER BLIGHT (Sclerotium fulvum). Montana. P. D. R. 15: 52.

NEMATODE DISEASE (Tylenchus tritici). Virginia, North Carolina, and South Carolina.

MOSAIC (virus) is known to occur in a few fields in North Carolina, and caused heavy losses, approaching 80 per cent, in some of them. Many infested fields may have been overlooked, according to Lehman, since most of the varieties grown do not show the striking rosette symptom but only the less conspicuous mosaic.

A mosaic also was reported from Kansas, where it occurred in 4 counties. Near Salina one 40-acre field was a complete loss because of the disease. P. D. R. 16: 115-116.

RYE

STEM RUST (Puccinia graminis) caused very little loss. P. D. R. 15: 137.

LEAF RUST (Puccinia dispersa). There was considerably more than usual in Massachusetts where 10 per cent loss was estimated, Indiana, with 5 per cent, and Ohio with 2 per cent. In other States the disease was unimportant.

ERGOT (Claviceps purpurea). Eighty per cent of the plants were observed to be affected in a field in Minnesota. Losses of 1.5 per cent were reported from Wisconsin and Colorado, 1 per cent from Massachusetts, trace to 0.1 per cent in other States. P. D. R. 15: 110.

POWDERY MILDEW (Erysiphe graminis). Kentucky. P. D. R. 15: 52.

SCAB (Gibberella saubinetii) caused a loss of 1 per cent in Ohio. Only traces were reported in other States.

BARLEY

COVERED SMUT (Ustilago hordei) occurred in practically the usual amounts. New York was the only State reporting more than usual, while Wisconsin, Kansas, and Colorado reported less. In Wisconsin, Vaughan said that it was difficult to find specimens for demonstration purposes. Losses estimated at 1 per cent or more were 10 per cent in Maryland; 4, Pennsylvania; 3, Virginia; 2, New York, Georgia, and South Dakota; 1, North Dakota.

LOOSE SMUT (Ustilago nuda and U. nigra). Although the losses from covered smut were higher in certain cases, loose smut seemed to be somewhat more important generally. Four States reported more, two less, while in other States there was about the usual amount. Losses of 1 per cent or over were 4 per cent, Kansas; 3, New York, and Virginia: 2.7, North Carolina; 2.5, Wisconsin; 2, Pennsylvania, Minnesota; 1, Maryland, Texas, North Dakota, South Dakota, and Montana. In New York, according to Barrus "Of 54 fields of barley grown for certification only four were reported as free from loose smut, 16 having percentages ranging from 1.1 to 4.6 per cent. These latter did not receive hot water treatment." Poole stated that in North Carolina "Loose smut was more widely distributed than in the two preceding years. Our Office of Pure Seed Certification reports this disease as interfering seriously with the certification of barley in many fields. Where the hot water treatment was given the infec-

tion was always low as compared with untreated." In Wisconsin, according to Vaughan, the hot water treatment was not entirely satisfactory but did reduce the amount of smut.

Some of the conflicting statements concerning control of barley loose smut by chemical seed treatments, etc. may be explained by Tapke's discovery that two species of Ustilago cause the disease, one undescribed the he calls U. nigra and the other previously known U. nuda. (Tapke, V. F. An undescribed loose smut of barley. Phytopath. 22: 869-870. Oct. 1932). P. D. R. 15: 109.

RUSTS. The only losses of 1 per cent or more reported were 1 per cent from STEM RUST (Puccinia graminis) in Virginia and Ohio, and 1.5 per cent from LEAF RUST (P. anomala) in Ohio. Other States reported only a trace of or no loss from either disease. P. D. R. 15: 108, 137.

STRIPE (Helminthosporium gramineum) was apparently more prevalent than in 1930. It was said to be much more important than usual in Minnesota, where it caused a loss of 2.5 per cent. Other losses of more than a trace were 2 per cent in Virginia and North Carolina; 1, Wisconsin, Montana; 0.5, North Dakota, Kansas. High maximum infections were reported from some States. In North Carolina 100 per cent was observed in some fields especially in areas where rainfall was abundant. A loss of more than 75 per cent occurred in one field in Michigan, and 60 per cent loss in a field in Wisconsin. In Minnesota the highest infection observed was 65 per cent. According to Vaughan, there has been a general reduction in the amount of stripe in Wisconsin due to the increasing use of the very resistant variety Wisconsin Pedigree No. 38 and to seed treatment with Ceresan. Other reports on varietal susceptibility were as follows: Very resistant, Wisconsin Pedigree No. 37 and Minnesota Glabron in Wisconsin. Susceptible, Wisconsin Pedigree No. 6 and Minnesota Velvet in Wisconsin; Glabron and Velvet in Minnesota; Velvet, Manchuria, Oderbrucker, and Minsturdi in Iowa; Mariout and Stavropol in Kansas. Very susceptible, Svansota and Minsturdi in Minnesota. P. D. R. 15: 109.

SCAB (Gibberella saubinetii), judging from the few reports received, was of about average prevalence or less. Ohio reported 5 per cent loss, Iowa 1 or 2 per cent, Wisconsin 1.5 per cent. Other losses reported were traces. P. D. R. 15: 108.

POWDERY MILDEW (Erysiphe graminis) caused losses of 1 per cent in New York and North Carolina. Reports from both States indicated that a wet spring favored its development. One field of late-planted barley in New York was said to have been ruined. The disease was severe in all fields observed in Kentucky. Early in the year it was reported as prevalent in Virginia. Wisconsin reported less than usual. P. D. R. 15: 49, 52.

O A T S

SMUTS (Ustilago avenae and U. levis) continued to cause important losses, which averaged, probably, about the same as usual for the country as a whole. There was a reduction in amount in Missouri and Kansas, where losses have been unusually heavy during the past few years. North Carolina, West Virginia, South Dakota, and Colorado also reported less. More than usual occurred in Georgia, Florida, Wisconsin, and Iowa. Other States reported about the normal amounts. Losses reported were 15 per cent in Florida and possibly in Pennsylvania; 10, Texas, Arkansas, and Iowa; 6, Montana; 5, Maryland and Wisconsin; 4, Virginia, Ohio, and Kansas; 3.5, Missouri; 3, New York, Georgia, and Minnesota; 2, Michigan and South Dakota; 1 to 2, West Virginia; 1, Indiana; others, less than 1 per cent.

STEM RUST (Puccinia graminis). Losses estimated are: 3 per cent, Illinois; 2, Florida; 1, Virginia and Minnesota; other States less than 1 per cent. In Louisiana according to Edgerton, "Stem rust appeared in epidemic form. This is very unusual in Louisiana where stem rust on oats is not common. Losses in some fields ran as high as 10 to 20 per cent."

CROWN RUST (Puccinia coronata) caused losses estimated at 5 per cent in Virginia and Florida; 4, New York; 1, Texas and Ohio.

ANTHRACNOSE (Colletotrichum graminicolum) was apparently the cause of considerable dying of oats in Arkansas during the winter months of 1931 (V. H. Young). Also reported from Texas.

LEAF SPOT (Helminthosporium avenae). Prevalent in North Carolina, most pronounced in low damp areas (Poole). Also reported from Michigan.

BLAST or STERILITY (undet.). Present in most fields in New York and Kansas every year. In New York according to Barrus, "Usually from 10 to 25 per cent of blasted spikelets may be found. Whether the remaining healthy spikelets yield more than if all were healthy is undetermined. Therefore, the loss from blast cannot be estimated."

ALKALINE SPOT due to heavy lime application, North Carolina. Most of the oats in the field were two to three feet high, but in spots were only three to five inches high and the leaves were yellow with bronzed margins. The roots were injured and many were dead, the plants being kept alive mostly by the feeding roots near the surface. The injury was most severe where lime had been piled. (Poole).

C O R N

SMUT (Ustilago zeae) was said to be more prevalent than usual in Massachusetts, in some of the Great Lakes States, including Ohio, Michigan (on sweet corn), Wisconsin, and Minnesota, and in Florida and Louisiana in the South. Practically all other States reporting indicated about normal amounts. Several reports mentioned sweet corn as affected most severely. Losses were reported as follows: 15 per cent, Michigan (sweet corn); 10, Minnesota; 3 to 5, West Virginia; 3, Ohio and South Dakota; 2 to 3, New York; 2, Massachusetts, Connecticut, Virginia, North Carolina, Florida,

and Texas; 1.5, Arkansas, Wisconsin, and Missouri; 1, Michigan, North Dakota, and Colorado; others less than 1.

ROOT ROTS AND EAR ROTS (due to various organisms). Gibberella saubinetii, Diplodia spp., Fusarium moniliforme, Fusarium spp., Penicillium sp., and Pythium sp. are the fungi associated with root and stalk rots and seedling blight, and ear rots. In general, both root rots and ear rots were reported as less destructive than usual. Drought may have complicated injury from root rot, as indicated in the reports from Minnesota, where "Losses were perhaps high in some fields, but it was impossible to say whether drought or the organism was the primary agent," and Kansas, where Melchers said "A drought similar to 1930 did much damage to the corn crop, and it is impossible to estimate the injury from this disease." I. T. Scott reported that root rot appears to be decreasing somewhat in Missouri, due perhaps to droughts for the past two seasons, more extensive rotation of crops on corn land, and better seed selection. In Indiana, according to J. F. Trost, "Pythium sp. was responsible for considerable killing of the plants late in the fall, following drought injury at silking." Losses of one per cent or more are as follows:

ROOT ROTS: 5 per cent, Massachusetts and Maryland; 4, Kansas (root, stalk, and ear rots); 3, Texas; 2, Florida.

EAR ROTS: 9 per cent, Texas; 8, Maryland; 4, Florida; 3, North Carolina; 2, Massachusetts and Virginia; 1.5, Missouri; 1.1, Indiana; 1, Ohio, Wisconsin, and Delaware.

BACTERIAL WILT (Aplanobacter stewarti) occurred in New Jersey, Maryland, Virginia, West Virginia, Texas, Arkansas, Ohio, Indiana, Iowa, and Kansas. None was observed in New York according to Chupp, although a number of sweet corn fields were examined, both upstate and on Long Island. The disease was again of more than average importance in West Virginia, Ohio, and Indiana, where losses were estimated at 10, 3, and 1 per cent, respectively. Iowa also reported increased amounts. Infections up to 100 per cent were observed in sweet corn fields in West Virginia and Indiana. Orton remarked "I think this epiphytotic of Stewart's disease was the most severe I have ever seen. It was accompanied by stalk rot (Bacterium dissolvens) in the same field. Forty-five of the 54 sweet corn varieties planted on the Experiment Farm at Lakin, West Virginia, were affected." J. F. Trost and G. M. Smith reported that "Golden Bantam sweet corn averaged 50 per cent loss this year in early plantings in Indiana. The low total loss is due to the small percentage of Bantam in proportion to fall season sweet corn." Pop corn was affected in Indiana and Iowa. Late dent corn, Evergreen, Country Gentleman, and Narrow Grain sweet corn were said to be very resistant in Indiana, while Golden Bantam and Sunshine sweet corn, Tom Thumb pop corn, and early flint corn were very susceptible. P. D. R. 15: 68, 110.

BACTERIAL STALK ROT (Bacterium dissolvens), West Virginia, Louisiana, Arkansas. In West Virginia it occurred together with bacterial wilt and was very destructive. (See also Stanley and Orton, Bacterial stalk rot of sweet corn. (Abst.) Phytopath. 22: 26. 1932).

LEAF SPOT believed to be due to bacteria was reported from Florida and Texas, and a bacterial leaf blight from Indiana. Infections of 60 and 100 per cent were observed in Indiana and Florida, respectively. In the latter State the disease was said to be very abundant during late spring and summer. In one field the loss was probably more than 25 per cent.

SORGHUM

ROOT, SHOOT, AND CROWN DISEASE, cause unknown, became evident locally in Kansas in 1928 and 1929, and has been increasing, although it is still local in distribution. In some fields of Milo, all plants are infected. Milos are especially susceptible, but most other sorghums are very resistant. Resistant selections of milos are being found. Soil conditions may be concerned but the disease appears to be parasitic. This may become a very important problem in milo growing. (Melchers).

RICE

BLAST (Piricularia oryzae) caused one per cent loss in Texas.

The following diseases were reported from Arkansas by E. M. Cralley:

FOOT ROT (Ophiobolus sp.) was more prevalent than usual.

STEM ROT (Sclerotium oryzae), is spreading slowly in Arkansas. As much as 25 per cent loss was estimated in some badly infected fields.

BLACK SMUT (Tilletia horrida) was not observed in 1931.

LEAF AND GLUME SPOTTING, undetermined, partly attributed to Helminthosporium sp., was very common.

STRAIGHTHEAD (Non-par.) caused considerable damage where present but was observed only in a few fields. (Also reported from Texas.)

FLAX

WILT (Fusarium lini) was more prevalent than usual in Wisconsin and Minnesota, the only States reporting. In Minnesota the hot weather during middle and late summer aggravated the damage from wilt and only very early sown flax escaped considerable injury even in resistant sorts. The loss was estimated at 13 per cent of which 10 per cent was reduction in yield. The varieties Bison, Buda, and Red Wing were resistant; all others were susceptible.

HEAT CANKER (non-par.) caused an unusual amount of loss, except in early sown flax, in Minnesota. As much as 90 per cent injury occurred in some fields. The total loss was estimated at 10 per cent. Heat canker was also reported from Montana.

RUST (Melampsora lini) and PASMO (Phlyctaena linicola) caused very little damage in Wisconsin and Minnesota due probably to dry weather.

DISEASES OF FORAGE CROPS

ALFALFA

BACTERIAL WILT (Aplanobacter insidiosum) was found for the first time in South Dakota during 1931; otherwise no unusual development was reported. A loss of 15 per cent was estimated in Kansas and 5 per cent in Massachusetts. P. D. R. 15: 161.

DOWNY MILDEW (Peronospora trifoliorum) was found on newly seeded alfalfa in Mason and Harrison Counties in West Virginia. This is the first report for the State. (Orton). It was more prevalent than usual in Louisiana. Practically all plants of the March crop were affected and the leaves turned yellow. It disappeared with warm weather (Edgerton). Reported from several other States.

LEAF SPOT (Pseudopeziza medicaginis) and LEAF BLOTCH (Pyrenopeziza medicaginis), less than usual. In Wisconsin the leaf spot was said to be more prevalent on soils deficient in lime and phosphorous.

BACTERIAL BLIGHT (Bacterium medicaginis). Arizona. P. D. R. 15: 69.

ROOT ROT (Phymatotrichum omnivorum). A loss of 25 per cent was estimated in Texas. Entire fields are killed by this disease. (Taubenhaus, Bach, and Wolff).

ROOT ROT (Fusarium sp.) caused 2 per cent loss in Missouri.

ROOT ROT (Undet.) Minnesota, of considerable importance.

STEM ROT (Sclerotinia trifoliorum). Pennsylvania, Virginia, and Washington. P. D. R. 15: 50.

WINTER INJURY, judging from the absence of reports, was less important than usual.

CLOVER

POWDERY MILDEW (Erysiphe polygoni). Rather generally reported but caused little damage.

STEM ROT (Sclerotinia trifoliorum) was severe locally in North Carolina during April. In Kansas it was found apparently for the first time attacking Dutch white clover in a lawn that was watered freely.

BLACK ROOT ROT (Thielavia basicola) found on red clover on infected soil in Guilford County, North Carolina.

SWEET CLOVER

LEAF SPOT (Ascochyta caulicola). Washington.

SMUT (Entyloma melilоti) has been observed on Melilotus indica for the past three years near Baton Rouge, Louisiana, increasing in amount each year. According to Dr. H. S. Jackson this is the first report of the fungus on the mainland of North America. (Edgerton, P. D. R. 15: 31).

ROOT AND STEM ROTS. Rhizoctonia sp. and Fusarium sp. have been isolated in Kansas. Corticium vagum was prevalent in North Carolina. Phymatotrichum omnivorum caused 20 per cent loss in Texas. Sclerotinia trifoliorum was destructive in Oregon, according to L. W. Kephart.

BLACK STEM AND ROOT ROT, destructive everywhere (Kephart).

MOSAIC (Virus) important in the central and eastern States (Kephart).

C O W P E A

POWDERY MILDEW (Erysiphe polygoni) is the one serious factor in growing cowpeas in North Carolina. It causes defoliation, destroys flowering parts, and suppresses growth. The loss is estimated at 10 per cent (Poole). Also in Texas.

ROOT ROT AND WILT, both due to Fusarium sp., caused losses in Virginia estimated at 3 per cent and 5 per cent, respectively. WILT (Fusarium tracheiphilum) was severe in scattered fields in North Carolina where it caused a loss of 2 per cent. About 50 per cent of the plants were affected in one field in Georgia, the disease appearing in yellow spots throughout the field with very little actual wilt. Also reported from Texas with 1 per cent loss.

STEM BLIGHT (Macrophomina phaseoli). Half of the plants in a field at the University of Georgia were infected. Most of the plants were also attacked by Fusarium (J. H. Miller).

MOSAIC (undet.). New Jersey and Louisiana.

STEM AND POD SPOT (Diplodia natalensis). Texas.

S O Y B E A N

PUSTULAR SPOT (Bacterium phaseoli sojense), very abundant in eastern North Carolina.

LEAF SPOT. Cercospora cruenta was common in North Carolina and caused severe damage to the leaves. Growers seem to think that the greater prevalence of leaf spot diseases is responsible for decreased yields obtained in recent years. (Poole). C. diazu, Louisiana.

DOWNY MILDEW (Peronospora manshurica). North Carolina.

WILT (Fusarium tracheiphilum) caused severe damage in fields in Currituck County, North Carolina. In one field the plants were not affected in low moist areas and under persimmon trees as in all adjacent areas. (Poole).

STEM ROT (Sclerotium rolfsii). Widespread and apparently increasing in importance in North Carolina. P. D. R. 15: 17.

ROOT ROT (Phymatotrichum omnivorum). Texas.

V E T C H (VICIA SPP.)

LEAF SPOT (Ascochyta pisi) is abundant in North Carolina and does heavy damage on soils where growth is rank and the plants become prostrate. It is less severe where vetch and grains are grown together (Poole). Ascochyta sp. reported also in New Jersey.

SPOT (Protocoronospora nigricans) is always present and sometimes does considerable damage to Vicia villosa which is allowed to mature as in western North Carolina where seed is grown. (R. McKee).

S U N F L O W E R

RUST (Puccinia helianthi-mollis) is often a limiting factor in growing sunflowers for silage in Wisconsin, according to R. E. Vaughan. Also reported from Connecticut, New Jersey, North Carolina, where it was very abundant, and Missouri.

OTHER DISEASES reported included POWDERY MILDEW (Erysiphe cichoracearum) in North Carolina, ROOT ROT (Phymatotrichum omnivorum) on Helianthus annuus and H. maximiliani in Texas, WILT (Sclerotinia sclerotiorum) in Washington, STEM ROT (Sclerotium rolfsii) in Louisiana, LEAF SPOT (Septoria helianthi) in Missouri.

D I S E A S E S O F V E G E T A B L E S

POTATO

LATE BLIGHT (Phytophthora infestans). With the exception of Massachusetts with 10 per cent, Maine with 7 per cent, and Texas with 3 per cent, the losses were considerably lower than an average year and somewhat less than 1930. Late blight has been known to occur in the lower Rio Grande Valley in Texas, but such a severe outbreak as this year is very unusual. No blight was seen in Minnesota, Wisconsin, Michigan, Arkansas, North Carolina, West Virginia, and New Jersey. P. I. R. 15: 7, 20, 46, 63, 68, 116.

EARLY BLIGHT (Alternaria solani). Ten per cent loss occurred in Virginia, otherwise this disease was generally slight. The other States reporting more than a trace of loss were Texas and Maryland, 5 per cent; Massachusetts, 3; Ohio, 2; Florida and Michigan, 1. P. D. R. 15: 47, 64, 116.

SCAB (Actinomyces scabies) was in general about as severe as in 1930 and somewhat more prevalent than an average year. The following major losses were reported: Wisconsin, 10 per cent; South Dakota and New York, 5; New Jersey and Minnesota, 3; Missouri and Maryland, 2.5; and Texas and Kansas, 2. Scab is reported to be a limiting factor in south Florida in muck soil. Wisconsin reports that results of demonstrations indicated corrosive sublimate to be the most valuable treatment for scab. Acid mercury was good on dormant seed, but injured sprouted seed. Semesan Bel was very irregular

in effectiveness. P. D. R. 15: 47, 64, 115.

STEM ROT (Corticium vagum). The losses resulting from this disease seem to be somewhat variable in different States from year to year; for example, Florida and Massachusetts each reported 1 per cent loss in 1930 and 10 per cent for 1931. Virginia reported a trace in 1930 and 7 per cent in 1931. Although the losses mentioned were greatly increased over 1930, generally, for the United States, they were about the same. Other States reporting more than one per cent were: Kansas, 6; Maryland, 5; Minnesota and New York, 4; Montana, 3; and Ohio, 2. P. D. R. 15: 116.

BLACK LEG (Bacillus phytophthorus) was about normal in occurrence and severity as indicated by the following losses reported: Kentucky, 3 per cent; West Virginia, 2 to 3; Kansas, 2; Michigan, Missouri, North Dakota, North Carolina, and Montana, 1. P. D. R. 15: 47, 64, 116.

WILT (Fusarium oxysporum) was probably less severe than an average year and somewhat less than last year. The four States reporting more than 1 per cent loss were: Montana, 4 per cent; Maryland and Minnesota, 2; and West Virginia, 1 to 2. P. D. R. 15: 7.

WILT (Bacterium solanacearum) was abundant in parts of North Carolina especially in soils which were infected as a result of the continuous cropping of tobacco. This disease is serious in certain scattered areas of Florida where it is of a more or less perennial nature. It is severe in Porto Rico. P. D. R. 15: 63.

TIPBURN AND HOPPERBURN (Climatic and leafhopper). The losses, aggravated possibly by the dry and hot growing season, were severe, equaling those of last year and probably somewhat greater than an average year. The States reporting more than 1 per cent loss were: West Virginia, 40 per cent; Arkansas, 30; New York, 15; Massachusetts, 10; New Jersey, 8; Ohio, 7; Michigan, Wisconsin, and Minnesota, 5.

LEAF ROLL (Virus). Due to more general use of certified seed leaf roll seems to decrease in New York and Maryland. The losses generally were about equal to those of a usual year. P. D. R. 15: 64.

MOSAIC (Virus) was generally reported to be less serious than usual which may be attributed to the increased use of certified seed and to the failure to recognize the symptoms due to the favorable growing season of the host. In Wisconsin, the high temperature reduced aphid infestation, therefore limiting the spread of the virus. Probably the same can be said of the other virus diseases of potatoes.

INTERNAL BREAK DOWN (non-par.). It was necessary to create a new grade in order to market the potatoes legally in Michigan where a 10 per cent loss occurred due to this disorder.

FERTILIZER BURN (Superphosphate). In West Virginia an interesting case was noted of burning of potatoes, which had been put in superphosphate sacks.

PREMATURE GERMINATION (High temperature). Wisconsin reports premature germination of new tubers in mid summer, the occurrence of which was most frequently on the south side of the row, thus indicating a heating relationship.

ROOT KNOT (Heterodera radiciola). On Long Island, New York, about 40 acres were so badly infested that the tubers were practically unsalable. Several other lots of potatoes were found to be infested in the same State.

TUBERS WITHOUT VINES (non-par.). Pennsylvania, Michigan, and Washington. P. D. R. 15: 53, 86, 132.

T O M A T O

LEAF SPOT (Septoria lycopersici) was generally much less severe than usual, probably due to the dry hot weather which prevailed during the growing season. A loss of 2 per cent was reported from Massachusetts, New York, and Kansas; 1.5 per cent from Missouri and Wisconsin.

WILT (Fusarium lycopersici) was about normal in severity. The States reporting more than 1 per cent loss were: Texas, 15 per cent; Virginia and Michigan, 5; Florida, 4; Kansas, 3; Indiana, North Carolina, and Missouri, 2. Texas, Missouri, Indiana, North Carolina, and New Jersey all reported as high as 50 per cent losses in some fields. P. D. R. 15: 102, 65.

BACTERIAL CANKER (Aplanobacter michiganense) was reported for the first time from North Carolina, Arkansas, Indiana, Nebraska, and New Mexico, but probably it had occurred in some of these localities previously, and had not been observed as such. For further information on this disease, see P. D. R. 15: 20, 48, 65, 86, 87, 101, 116.

EARLY BLIGHT (Alternaria solani). Generally the losses reported were a little more than usual. New York, New Jersey, Michigan, Wisconsin, and Minnesota report less than normal; Maryland, Virginia, and Ohio more than usual. The States reporting more than 1 per cent loss were: Massachusetts, 10 per cent; Virginia, 10; Maryland, 7; and Indiana, 2. P. D. R. 15: 67, 117.

LEAF MOLD (Cladosporium fulvum) was reported as being severe in greenhouses in New York, Indiana, and Ohio.

BUCK-EYE ROT AND BLIGHT (Phytophthora terrestris) was reported for the first time for New Jersey. It also occurred in New York, Florida, Arizona, and Texas, but the losses were small. P. D. R. 15: 48.

LATE BLIGHT (Phytophthora infestans) was severe in Texas where a 20 per cent loss occurred. For details see P. D. R. 15: 53. It was also noted in Connecticut, New York, and Florida, and Mexico. P. D. R. 15: 26, 48.

BLOSSOM END ROT (non-par.). The following States reported more than usual, New Jersey, North Carolina, Florida, Ohio, and Michigan, whereas in Wisconsin and Minnesota there was much less and less, respectively. Michigan reports the heaviest loss of 15 per cent. P. D. R. 15: 65, 102.

BLACK SPOT (Phoma destructiva). Weber of Florida reports this disease to be more plentiful than ever before. It caused extensive damage throughout the season and injured all varieties including Marglobe. The loss was estimated to be over a million dollars.

MOSAIC (Virus) caused about the usual amount of loss in greenhouses and field plantings. Mosaic in New York has become of minor importance since eradication of the weed hosts about the seed beds has been practiced. In Minnesota a type of mosaic somewhat different from the usual type was prevalent, characterized by a mosaic pattern of large irregular yellow spots with slight crinkling of leaves. P. D. R. 15: 48.

CURLY TOP OR WESTERN YELLOW BLIGHT (Virus) was severe in Utah. P. D. R. 15: 87.

STREAK (Virus) caused considerable losses in the field in California and in greenhouses in Ohio. (S. P. Doolittle).

ROOT KNOT (Heterodera radicicola) caused considerable damage in greenhouses in New York, Arkansas, and Wisconsin, and in fields in North Carolina and Texas.

COLLAR ROT (various organisms) was very severe on several lots of plants which had "heated" during transit. Colorado reported 30 per cent reduction in yield for that State. It was also prevalent in Maryland.

OTHER DISEASES. WILT (Verticillium alboatrum), Massachusetts, in greenhouse; rather common in California. P. D. R. 15: 65. SOUTHERN BLIGHT (Sclerotium rolfsii) was common in Georgia, Texas, Florida, and North Carolina. P. D. R. 15: 17, 65, 102. DODDER (Cuscuta sp.), New York, one specimen. LEAF ROLL (undet.), New Jersey, severe rolling of leaves but no evident injury. LIGHTNING INJURY, New Jersey and Connecticut.

SWEET POTATO

BLACK ROT (Ceratostomella fimbriata). Except in Missouri, Delaware, and North Carolina which reported more, the losses were about normal. States reporting more than 1 per cent loss were: Texas, 10; North Carolina and Kansas, 8; Virginia, 3; Missouri, 2.5; and Maryland, 1.5. Sprout treatment with organic mercury compounds reduced severity in New Jersey. P. D. R. 15: 54, 162.

SCURF (Monilochaetes infuscans) was about normal in occurrence. The outstanding losses were 20 per cent in Virginia, and 4 per cent in New Jersey.

STEM ROT, WILT (Fusarium batatatis and F. hyperoxysporum). The following loss estimates were given: Virginia, 15 per cent; New Jersey, 12 per cent; Kansas and Indiana, 5; North Carolina, 3; Missouri, 2; and Maryland, 1.

SOIL ROT, POX (Actinomyces sp.) seems to be increasing in prevalence and destructiveness in Maryland.

SOFT ROT (Rhizopus nigricans) was very severe in Missouri. The collaborator attributes this to the fact that the potatoes were dug late and stored in a rather immature state. Drought during the summer had held back growth of roots, then the fall rains caused the vines to still be growing at digging time. The disease was reported as being severe in Texas, North Carolina, Delaware, and New Jersey.

MOTTLE NECROSIS (Pythium spp.). Ten per cent was observed in one field in New Jersey. It was also noted in Maryland, Indiana, and North Carolina.

BROWN RING (Tylenchus dipsaci) appeared again in New Jersey. P. D. R. 15: 41.

SCLEROTIUM ROT (Sclerotium rolfsii). Considerable injury in plant beds in Arkansas. P. D. R. 15: 54.

B E A N

BACTERIAL BLIGHT (Bacterium phaseoli) seemed to be somewhat more severe than usual. Those States reporting more than normal with the percentage of loss are given: Colorado, 40; Virginia, 30; Michigan, 10-15; Texas, 12; and New York, 5. The greatest damage according to collaborators in Massachusetts, Maryland, and Virginia appeared to be from pod blight which occurred rather late in the season. P. D. R. 15: 117.

ANTHRACNOSE (Colletotrichum lindemuthianum) caused about the usual amount of loss. Florida and Louisiana report heavy losses due to conditions favorable for the disease during early spring. It was evidently too dry for this disease to do much damage in Minnesota, Wisconsin, and Maryland. P. D. R. 15: 117.

RUST (Uromyces appendiculatus) was reported to be severe in Arizona.

MOSAIC (Virus) caused a 15 per cent loss in New York, which was much more than usual. Wisconsin, Michigan, Florida, and Virginia all report Refugee variety as being very susceptible. P. D. R. 15: 117.

STEM ROT (Corticium vagum) seemed to be more prevalent than usual in New York, New Jersey, and Florida. The other States reporting record about the normal occurrence.

ROOT KNOT (Caconema radicicola) was severe in Florida where the loss was estimated at 5 per cent. It also did considerable damage in Texas and Missouri.

POWDERY MILDEW (Erysiphe polygoni) caused a loss of 2 per cent in North Carolina. The loss in Florida was only 1 per cent but the practice of dusting with sulphur undoubtedly prevented much larger losses in this State.

YELLOWING (Manganese deficiency). A loss of 5 per cent occurred in Florida, and cases of 100 per cent loss were not uncommon on burnt soil where manganese was not used.

LIMA BEAN

BACTERIAL BLIGHTS. Bacterium phaseoli was reported from Michigan and Georgia. In Michigan Limas were said to be affected much more severely than usual. The loss was 2 per cent. In Georgia one nine-acre field had at least 80 per cent loss, two other fields about 10 per cent , and others showed varying amounts according to J. H. Miller.

Bacterium medicaginis phaseolicola (halo blight). Considerable pod infection occurred in Georgia, as much as 40 per cent in one field. Also reported from Massachusetts.

Bacterium vignae (= B. viridifaciens; bacterial spot), reported from Massachusetts, New York, Delaware, Maryland, Georgia, Florida, and Porto Rico. W. H. Moore reported the loss of about a third of the crop in one thirty-acre field in Georgia.

ONION

SMUT (Urocystis cepulae). Massachusetts and New York report 10 and 5 per cent losses, respectively, which were about normal, and Ohio reports 5 per cent loss, much more than usual for that State.

DOWNY MILDEW (Peronospora schleideni) was conspicuous by its absence. Of the five States reporting only New York and Maryland report even a trace of loss.

PINK ROOT (Fusarium malli) caused 10, 5, 2-3 per cent losses in Texas, Ohio, and New York, respectively. The damage was probably aggravated by the dry, hot weather which prevailed. P. D. R. 15: 117.

BLACK MOLD (Aspergillus niger) was reported on stored onions from Texas, Kansas, and Washington. P. D. R. 15: 103.

STEM NEMATODE (Tylenchus dipsaci). In New York this trouble was first observed by the growers in 1930 when there was one spot about four feet in diameter in an onion field on the muck soil. By July, 1931, this spot had increased to 50 feet in diameter, and another spot 10 feet in diameter had appeared nearby. Every onion in these two areas was killed by a constant spread of the organism. The infested soil was steam sterilized with hopes of completely eradicating this disease. According to Steiner this is the first report of this nematode on onions in this country.

CABBAGE

Davis and Boyd of Massachusetts make a general statement that this year the plants generally were more healthy than during the past ten years.

YELLOWS (Fusarium conglutinans). The losses from this disease were about normal. Those States reporting more than one per cent loss are: Maryland, 8 per cent; Michigan, 3; Texas and Missouri, 2; and Wisconsin 1.5. Maximum infections reported were 100 per cent, New York; 50-70, Michigan; 35, Kansas; and 21, Missouri.

BLACK ROT (Bacterium campestre). New York reports over 50 per cent infection of the plants in a seed bed containing more than five million plants. Many fields set from this bed were a complete loss. The disease was well distributed in Florida and was serious in certain fields. Indiana reports 60 per cent loss in one field. P. D. R. 15: 62.

CLUB ROOT (Plasmodiophora brassicae). In New York one four-acre field was completely destroyed. According to Chupp, hydrated lime gives good control but care should be taken not to use too much lime, especially in short rotations. This disease was also severe in many plantings in North Carolina, Indiana, and Ohio.

BLACK LEAF SPOT (Alternaria brassicae). Very common and injurious in Florida and North Carolina. In New York it followed rather generally the dry hot weather injury that occurred on late varieties in October.

DROP (Sclerotinia sclerotiorum) was common and destructive in fields in all portions of Florida and caused from 2 to 3 per cent loss of heads. Missouri reports this year as being the first authentic occurrence of this disease.

C A U L I F L O W E R

In Massachusetts LEAF SPOT (Alternaria brassicae) was about as prevalent as usual in various parts of the State, while BLACK ROT and BACTERIAL SPOT (Bacterium maculicolum) were decidedly more damaging than in the average year, especially to the later plantings. In no instance where heavy infection of either disease occurred had seed or seed-bed treatment been practiced.

B R O C C O L I

Connecticut reports four diseases new for this host in the State, BLACK LEAF SPOT (Alternaria brassicae), BLACK LEG (Phoma lingam), CLUB ROOT (Plasmodiophora brassicae), and DOWNY MILDEW (Peronospora parasitica).

H O R S E R A D I S H

WILT (Verticillium alboatrum) caused a 20 per cent loss in Michigan.

R A D I S H

WHITE RUST (Albugo candida) is severe in a few greenhouses in New York. It usually starts on the fall crop and becomes worse on succeeding crops through the winter.

CLUB ROOT (Plasmodiophora brassicae) was serious in New York in an occasional field, and several fields on Long Island were destroyed.

BLACK ROOT (Aphanomyces raphani) was serious on Long White variety in Connecticut, where it had not previously been reported. Also reported from Ohio and Indiana.

CUCUMBER

WILT (Bacillus tracheiphilus) was generally about as prevalent as usual. It was more destructive than usual in Massachusetts, New York, Ohio, and Minnesota where it caused losses of 15, 5, and 4 per cent, and a trace, respectively. Those States report the season as being generally favorable for the increased population of the cucumber beetle. P. D. R. 15: 118.

DOWNY MILDEW (Pseudoperonospora cubensis). Texas and Porto Rico reported severe attacks of this disease. In other States reporting there was much less than usual, in some cases practically none. Apparently the weather was too dry for its occurrence. P. D. R. 15: 48.

MOSAIC (virus). New York reports 15 per cent loss for the State which is more than usual. Maximum infections for some fields where weed host eradication is not practiced were as high as 90 to 100 per cent. Mosaic seems to be increasing in importance in Florida. In most other States less than usual was reported. P. D. R. 15: 118.

ANGULAR LEAF SPOT (Bacterium lachrymans). Massachusetts and Michigan reported more than usual, otherwise this disease was conspicuous by its absence, probably due to the dry weather. No State loss was reported greater than a trace, although 30 per cent loss occurred in one large greenhouse in Michigan. P. D. R. 15: 118.

LEAF SPOT (Bacterium cucurbitae). First report of this organism on cucumbers was from Massachusetts.

ANTHRACNOSE (Colletotrichum lagenarium). G. H. Godfrey reported 50 per cent loss in one field in Hawaii. Generally anthracnose was unimportant, although there was said to be more than usual in Ohio, and severe defoliation occurred locally in New Jersey.

SCAB (Cladosporium cucumerinum) was generally of slight importance although it caused severe damage in some fields in Massachusetts and Florida. According to Weber, this seems to be the first authentic collection in Florida. P. D. R. 15: 118.

POWDERY MILDEW (Erysiphe cichoracearum) very little reported. Referring to eastern Massachusetts Guba said, "Disease was practically absent although greenhouse conditions were about the same as in other years. The lack of powdery mildew is hardly explainable." P. D. R. 15: 48.

LEAF SPOT (Septoria cucurbitacearum), reported for the first time from Massachusetts in a commercial planting in Hampshire County. Many leaves had literally hundreds of spots but the crop appeared to be little affected. Nearby muskmelons and winter squash were also attacked.

GUMMY STEM BLIGHT (Mycosphaerella citrullina). Two small patches in Niagara County, New York, were completely destroyed by this disease which was probably present because of high temperatures (Chupp). Also reported from New Jersey.

ROOT KNOT (Caconema radicicola) caused 2 per cent loss in greenhouses in Massachusetts. Guba states that a soil drench of carbon disulfide emulsion is occasionally used. No other chemicals are of value. In North Carolina the commercial crop is not affected since it is harvested before infestation is general. Also reported from Texas.

MUSKMELON

BACTERIAL WILT (Bacillus tracheiphilus) caused a reduction in yield of 10 per cent in Massachusetts with an additional 5 per cent loss in marketability. Cucumber beetles were said to be more numerous than usual. The disease was general and destructive in New York also where the loss was 2 to 3 per cent.

ANTHRACNOSE (Colletotrichum lagenarium) was unimportant in 1931, probably due to dry weather as noted in a number of States.

LEAF BLIGHT (Macrosporium cucumerinum). In Massachusetts, Connecticut, New York, Delaware, central and northern Florida, and locally in Arkansas and Ohio, leaf blight was more prevalent than usual. In Maryland losses were said to be decreasing due to greater use of spraying and dusting. Losses estimated were 10 per cent, of which 5 per cent was reduction in yield, in Massachusetts; and 2.5 per cent, of which 1 per cent was reduction in yield, in Maryland.

DOWNY MILDEW (Pseudoperonospora cubensis). Boyd and Davis state that absolutely none was seen or reported in Massachusetts, which is very unusual. According to Weber it was not as destructive as last year in Florida where it usually occurs wherever the host is grown and often causes serious damage. Several other States also reported reduced prevalance. In Texas, however, it was said to be severe, and caused a loss of 5 per cent. In Maryland, 1 per cent reduction in yield and 1.5 per cent loss in marketability were estimated. P. D. R. 15: 48.

POWDERY MILDEW (Erysiphe cichoracearum) did not seem to be very important except in Texas where 10 per cent loss was reported. P. D. R. 15: 48.

MOSAIC (virus). Two types of mosaic occurred in New York on muskmelon. The common cucumber mosaic was serious, causing 90 to 100 per cent loss in many fields where rigid weed host eradication was not practiced. The total loss for the State was 5 per cent. Another form to which cucumbers seemed to be immune was observed in the Great Lakes Counties in 1930 and was fully as common in 1931. One one-acre field in Orleans County had only four healthy plants. (Chupp).

LEAF SPOT (Septoria cucurbitacearum) was reported for the first time from Massachusetts where it was found September 1, causing very slight injury in one field near an infected squash field. (Boyd and Davis).

LEAF SPOT, GUMMY STEM BLIGHT (Mycosphaerella citrullina). Leaf spot occurred in one field in Massachusetts. The disease was found in one planting of what is known as "Persian Cantalcupe" in New York; other varieties in the same field were not affected.

WILT (Fusarium sp.). The same Fusarium that was reported in New York in 1930 was even more common in 1931. F. niveum caused 1 per cent loss in Missouri.

PUMPKIN

BACTERIAL WILT (Bacillus tracheiphilus) was more prevalent than usual in New York where it caused 1 per cent loss.

BACTERIAL LEAF BLIGHT (Bacterium cucurbitae) was found in Massachusetts for the first time. It was less severe than on winter squash.

BLACK ROT (Mycosphaerella citrullina) caused only a trace of reduction in yield in Massachusetts, but 2.5 per cent loss in marketability. This is the first report for the State.

LEAF SPOT (Septoria cucurbitacearum). Massachusetts.

SQUASH

BACTERIAL WILT (Bacillus tracheiphilus) was more severe than usual on both summer and winter squash in Massachusetts and New York. The cucumber beetles were numerous in Massachusetts where bacterial wilt was the most important field disease of both kinds of squash. The loss in Massachusetts was 15 per cent of which 10 per cent was reduction in yield. One per cent loss was estimated in New York. P. D. R. 15: 118.

BACTERIAL LEAF BLIGHT (Bacterium cucurbitae) was present late in the season and caused slight to severe leaf damage in almost every field of winter squash observed in Massachusetts. It occurred on summer squash also but was more abundant and severe on the winter squash. The total loss was 2 per cent. (Boyd).

SCAB (Cladosporium cucumerinum) was severe locally on summer squash in Massachusetts. P. D. R. 15: 118.

POWDERY MILDEW (Erysiphe cichoracearum) reported from several widely scattered States, said to be common and rather severe in Florida and Texas. P. D. R. 15: 48.

MOSAIC (virus) was said to be more prevalent than last year in Massachusetts and New York and occurred also in several other States. Summer squash showed greater injury than winter squash in Massachusetts. P. D. R. 15: 118.

LEAF SPOT (Septoria cucurbitacearum) reported from Massachusetts. Premature defoliation occurred in some fields. Winter squash was more severely affected than summer squash. A few cases were seen where Hubbard fruits were spotted.

LEAF SPOT, GUMMY STEM BLIGHT, BLACK ROT (Mycosphaerella citrullina). The black rot was the most important fruit rot observed in storage houses in Massachusetts during February and March of 1931. In the field the disease was first noticed about the beginning of September, causing leaf

spots, and cankers on stems, petioles, and fruit stalks, and later decay of young imperfectly developed fruit. Storage rot began to appear about two weeks after harvest. P. D. R. 15: 35, 118.

STORAGE ROTS (various fungi). Loss averaged about 35 per cent, said to be about usual, in Massachusetts. The most important organisms were Mycosphaerella citrullina and Fusarium sp., while secondary invaders included Rhizopus, Penicillium, Aspergillus, Cephalothecium, bacteria, etc. P. D. R. 15: 35.

W A T E R M E L O N

ANTHRACNOSE (Colletotrichum lagenarium) was generally less abundant than usual, although Maryland and Ohio reported more. In Florida, where it is usually very important, the extremely dry season greatly reduced losses. Maryland reported 8 per cent loss, of which 7 per cent was loss in grade. Kansas reported 1 per cent loss.

WILT (Fusarium niveum). Rotation, planting on disease-free soil, and use of resistant varieties are used to reduce losses from this disease with good results, usually. The disease does not occur in the main watermelon section of southwestern Arkansas, according to V. H. Young, but it is severe in Lonoke County which has important local plantings, and the Iowa resistant varieties have been planted there with considerable promise. Resistant varieties used in a number of counties in Indiana, although not completely resistant give good control, but are only fair in quality. In Missouri the reduction in yield was estimated at 16 per cent.

STEM-END ROT (Diplodia sp.). North Carolina, Texas, Missouri. In North Carolina the disease is abundant but is not serious since affected melons can be pulled from the vines in time to permit others to benefit from the thinning. Two per cent loss in quality was reported in Missouri.

FRUIT ROT (Pythium sp., spiny form), Connecticut. GUMMY STEM BLIGHT (Mycosphaerella citrullina), Virginia, Georgia, Missouri. Two per cent loss in Virginia. P. D. R. 15: 102. FRUIT ROT, STEM ROT (Sclerotium rolfsii). North Carolina and southeastern Missouri.

C E L E R Y

EARLY BLIGHT (Cercospora apii) was more severe than usual in New York, Delaware, North Carolina, Ohio, Indiana, Michigan, and Wisconsin. North Carolina reports it as abundant and severe on late celery. In Indiana it was said to be very difficult to control. In Michigan there was probably the most serious outbreak recorded for this State. It was present everywhere and caused very serious losses in irrigated fields.

In Connecticut and New Jersey, on the other hand, there was apparently no increase over last year and Massachusetts notes, "The disease has grown less for the past six years."

LATE BLIGHT (Septoria apii) was reported as less prevalent than usual in Connecticut, New York, North Carolina, Michigan, Wisconsin, Minnesota, and Colorado. Massachusetts, however, reported much more than usual with

an estimated loss of 5 per cent. While Florida reported 12-15 per cent loss in the Sarasota area. For market reports of this disease see P. D. R. 15: 26-37, 15:50.

In Michigan losses in celery from ROOT KNOT (Caconema radicicola), YELLOWS (Fusarium sp.), and BLACK HEART (non-par.) were all observed as unusually high.

SOFT ROT (Sclerotinia libertiana) was reported in unusual abundance from Massachusetts with an average loss of 10 per cent in the eastern part of the State. New York - "Mostly a storage trouble. Probably ruined 1,000 or 2,000 crates in cold storage."

MOSAIC (virus), more severe in Florida in localized areas. (F. Wellman).

L E T T U C E

GRAY MOLD ROT (Botrytis cinerea) was reported as very abundant, causing as high as 50 per cent loss in some plantings.

WILT AND STUNT (Pythium sp.) caused very heavy losses in head lettuce out of doors near Bay City, Michigan.

DROP (Sclerotinia sclerotiorum) is reported as relatively of little importance in such northern States as Connecticut, New York, and Indiana; prevalent but of slight importance in North Carolina; and severe in Florida, where the losses this year are estimated as 10 to 20 per cent which is somewhat lower than last year.

P E A

ROOT ROT (Aphanomyces euteiches) is reported as the principal trouble of peas in New York State. The losses are estimated at only 2 to 3 per cent. Maryland indicates 5 per cent loss. In Wisconsin, the combined losses from root rot and the effect of high temperatures on the weakened plants equalled half the crop. P. D. R. 15: 62-63 and 87-88.

WILT (Fusarium martii pisi), reported as rare in New York State; locally important in New Jersey, Maryland, Ohio, Wisconsin, Montana, and Colorado. P. D. R. 15: 62 and 87. See also P. D. R. 15: 88.

A S P A R A G U S

RUST (Puccinia asparagi) reported as follows: Connecticut, appearing on some of the resistant varieties. New York, rare. New Jersey, scattered but more than usual. Maryland, losses from rust are gradually being reduced by use of resistant varieties. Georgia, on an estate on Butler Island half the plants were practically killed by this disease. North Carolina, Texas, Wisconsin, and Missouri, scattered.

B E E T

SCAB (Actinomyces scabies) reported as more severe than usual in Massachusetts and New York.

CARROT

ROOT KNOT (Heterodera radicicola) was reported from West Virginia, Connecticut, and New York. In the last named State, Chupp reports "Severe on 20 acres in Oswego County, 95 per cent unmarketable carrots on one farm."

EGGPLANT

BLIGHT (Phomopsis vexans) reported from Connecticut, bad on fruit in one instance. New Jersey, less than usual. Virginia, damped off approximately 35 per cent of the plants in the seed bed on one farm near Norfolk and many of the remaining plants bear stem cankers; average loss 5 per cent. Florida, about the same as last year, widespread and destructive on seedlings, foliage, stems and fruit. Also common in Texas and Porto Rico.

SPINACH

DOWNY MILDEW (Peronospora effusa) was reported from Connecticut, New York, New Jersey, Maryland, Virginia, Missouri, and Texas usually as occurring in about the same amounts as in previous years.

DISEASES OF SPECIAL CROPS

TOBACCO

During the spring and summer of 1931 special surveys of tobacco disease were made in the States of Pennsylvania, Kentucky, Indiana, Wisconsin, New York, Maryland, West Virginia, Massachusetts, South Carolina, and also in Canada. The results of these have been fully reported in the P. D. R. 15. See Index pp. 188-189. The outstanding event was the outbreak of DOWNY MILDEW. See P. D. R. 15: 32, 43, 44, 45, 57, 58, 61, 72, 85, 94.

COTTON

WILT (Fusarium vasinfectum), prevalent, as usual, where cotton is grown, especially on light, sandy-loam soils. The use of resistant varieties reduces losses. A resistant strain of Mexican Big Boll is being developed in North Carolina, according to R. F. Poole. Dixie 14, Dixie Triumph, Super-Seven, Cook, and Lightning Express were listed as very resistant in Arkansas; Rowden 40, Rowden 2119, D. and P. L. Strains, Express as resistant; Acala as susceptible, and Trice and Delfos as very susceptible; by V. H. Young who says, "Counts were made in several localities in eastern Arkansas, and yield and wilt records were kept at the Cotton Branch Station. This year the beneficial effect of potash fertilizers and wilt resistant varieties was very marked. A great deal of partial recovery was noted after rains in July." Losses reported were: 5 per cent, Florida and Texas; 4, Arkansas; 2, North Carolina. P. D. R. 15: 83.

ROOT ROT (Phymatotrichum omnivorum) caused a loss of 15 per cent in Texas. P. D. R. 15: 99.

WILT (Verticillium alboatrum). Specimens of this disease were collected from Bolivar, Washington, Yazoo, and Sunflower Counties in Mississippi, and the fungus recovered in culture. Symptoms of the disease are noticeable defoliation of the plants, usually occurring rather late in the season, and ratooning at basal nodes together with vascular discoloration. Losses at present small in these localities, but some fields observed with as high as 20 per cent infestation. (D. C. Neal).

ANTHRACNOSE (Glomerella gossypii) was apparently of slight importance generally. The only loss of more than a trace reported was 3 per cent in Missouri. P. D. R. 15: 119.

STEM ROT, DAMPING OFF, SORESHIN (Corticium vagum) was said to be rather severe in North Carolina and Arkansas. In both States replanting was necessary. Two per cent loss was estimated in North Carolina, and 1 per cent in Texas. P. D. R. 15: 59, 82.

ANGULAR LEAF SPOT (Bacterium malvacearum) was widespread in North Carolina and probably damaged early cotton on sandy soils. According to D. C. Neal it caused serious injury to seedling cotton in the black lands of Texas and later was responsible for considerable boll shedding. He estimated the loss at 3 per cent. Also reported from Florida with a loss of 1 per cent; and from Georgia, Louisiana, Arkansas, and Missouri, as apparently of slight importance. P. D. R. 15: 119.

BLACK LEAF SPOT (Macrosporium nigricantium) caused severe injury on one farm in North Carolina where the plants were completely defoliated before the bolls matured. Other fields showed different degrees of infestation in isolated areas. The disease was not of wide occurrence, however. (R. F. Poole).

RUST. Puccinia hibisciata caused considerable injury near Casa Grande, Arkansas, according to E. D. Eaton of the Sacaton Station. It was also reported from Texas. Kuehneola gossypii was reported from Porto Rico.

SEEDLING DISEASE caused by the nema Aphelenchus parietinus was reported by C. H. Arndt and G. Steiner from South Carolina. (P. D. R. 15: 82-83).

MALNUTRITION (non-parasitic rust). North Carolina: Loss 5 per cent. Deficiency diseases interpreted from prevailing symptoms as lack of Potash, Magnesium, and Manganese were especially prominent during the drought and late autumn seasons, especially on light sandy soils. (R. F. Poole). Texas: Prevalent in the lighter soils of east Texas, and frequently found in association with Alternaria leaf-blight. Considerable defoliation of plants was caused by this disease. (D. C. Neal). Arkansas: Loss 3 per cent. Very common on sandy potash - poor soils. Beneficial effects of potash fertilizers and stable manure very marked. Much immaturity and failure to open properly of top bolls attributed to rust. (V. H. Young).

FERTILIZER INJURY. North Carolina: Heavy loss of plants, not directly due to Corticium vagum, soon after germination, resulted from concentrated fertilizers, probably nitrogen and potash. (Poole).

MOSAIC (non-par.). A mosaic disease of cotton, apparently a non-infectious type, and similar to sweet potato mosaic, occurred at Greenville, Texas. This malady has been observed for several years by H. C. McNamara, (U.S.D.A.), who finds that it is not communicable through contact or insects, but is a definitely inherited character. (D. C. Neal).

ALBINISM, CHLOROSIS (non-par.). Chlorosis, or whitening of leaves of cotton plants was observed in Mississippi and Texas, the varieties affected being Lone Star and Delfos. Damage negligible. (D. C. Neal).

LIGHTNING INJURY. North Carolina: Very prominent. Some of areas showed complete kill of plants in circles of 50 feet in diameter. Other spots struck showed a few plants killed near the strike and others scorched a distance of 25 feet away, and frequently cankered, but not killed. (R. F. Poole). Arkansas: Two small killed areas noted this year. Noted rarely in previous years. (V. H. Young).

DISEASES OF TREES

DROUGHT AND WINTER INJURY: Clinton lists the following hosts reported as suffering from the combined effects of drought and winter injury in Connecticut: Quercus rubra, Q. prinus, Pinus spp., Picea spp., Tsuga sp., Prunus sp. (cherry), Acer sp.

SPRUCE (PICEA SPP.)

CANKER (Cytospora sp.) was observed in various sections of Massachusetts. Three trees in Taunton showed from 25 to 75 per cent of the limbs killed.

PINE (PINUS)

DISTRIBUTION OF WHITE PINE BLISTER RUST (CRONARTIUM RIBICOLA) IN 1931 (WITH FIG. 22). Climatic conditions during 1931 were favorable for the extensive spread of the white pine blister rust in the Eastern United States. From the generally infested region the disease spread southward into the bordering States. In Maryland, scouting showed it to be present at 6 centers in Washington County, 1 on pine and Ribes, and 5 on Ribes alone; and at 2 centers in Allegany County on Ribes. Ribes were found infected in Virginia at 2 centers located in Frederick and Rappahannock Counties; in West Virginia, at 2 centers in Randolph and Tucker Counties; and in Ohio at 2 centers in Ashtabula County and 1 each in Fulton and Geauga Counties. White pine was found infected in Iowa, in Tama County.

Many new centers of infection were located in the Lake States. The Counties of Alpena, Chippewa and Iron in Michigan, and of Dane and Jackson in Wisconsin, were found infested. Pine infection was discovered for the first time in Iosco and Oceana Counties, Michigan, and in Chippewa, Oconto, Pepin, Pierce, and Waupaca Counties, Wisconsin. The disease was also found on white pine in the Ottawa National Forest in Michigan, and on Ribes in the Chippewa National Forest in Minnesota.

In the commercial areas of western white pine in northern Idaho, 45 additional centers of pine infection were found showing the rust to be firmly established in that region. These centers were distributed as follows: On the National Forests, 24 centers on the St. Joe, 2 on the Coeur d'Alene, and 1 on the Clearwater; on the Timber Protective Associations, 4 centers on the Coeur d'Alene, 7 on the Potlatch and 7 on the Clearwater. One new pine infection center was found in Mount Rainier National Park and another within a half mile of the Wind River Nursery in Washington. In Oregon, the only new pine infection center located is in the Mount Hebo Plantation on the Siuslaw National Forest.

New Ribes infections were found in northeastern Washington at 4 points in Stevens County and 9 points in Ferry County, while in Oregon infected Ribes were located at 21 points, none of which mark a further extension southward than reported in previous years. The disease was again found on Ribes (currant and gooseberry plants) in southwestern Oregon within 40 miles of the California line and within the range of valuable forests of sugar pine which are known to be susceptible. It appears certain that the rust will reach the main sugar pine belt of California when favorable conditions for spread occur in that region. (J. F. Martin and R. G. Pierce).

RUST (Cronartium cerebrum) was reported on long-leaf and loblolly pines in Georgia; P. banksiana in New York. P. D. R. 15: 91, 104.

J U N I P E R (JUNIPERUS SPP.)

BLIGHT (Phomopsis juniperovora) was especially destructive on seedlings in beds in Kansas.

M A P L E (ACER SPP.)

WOOD ROTS (Fomes fomentarius and F. igniarius). Very prevalent in North Carolina.

LEAF BLIGHT (Gloeosporium acerinum) abundant in North Carolina.

CANKER (Phomopsis sp.) on Acer palmatum. Scattered in New Jersey. Most serious on young nursery stock, although cases were observed on established trees.

TAR SPOT (Rhytisma acerinum), more abundant than usual in Massachusetts, North Carolina, and Wisconsin; also reported from Connecticut and New Jersey.

TWIG BLIGHTS. New Jersey reports twig blights on maple due to Steganosporium pyriforme and to Sphaeropsis sp.

WILT (Verticillium sp.) was reported from Massachusetts, Connecticut, New Jersey, Ohio, Missouri, and Rhode Island. P. D. R. 91.

H O R S E C H E S T N U T (AESCULUS HIPPOCASTANUM)

LEAF BLOTCH (Guignardia aesculi) was very important for the past three years in Massachusetts. Fifty per cent defoliation was observed in some places during August. In Connecticut it was "bad; complicated with scorch."

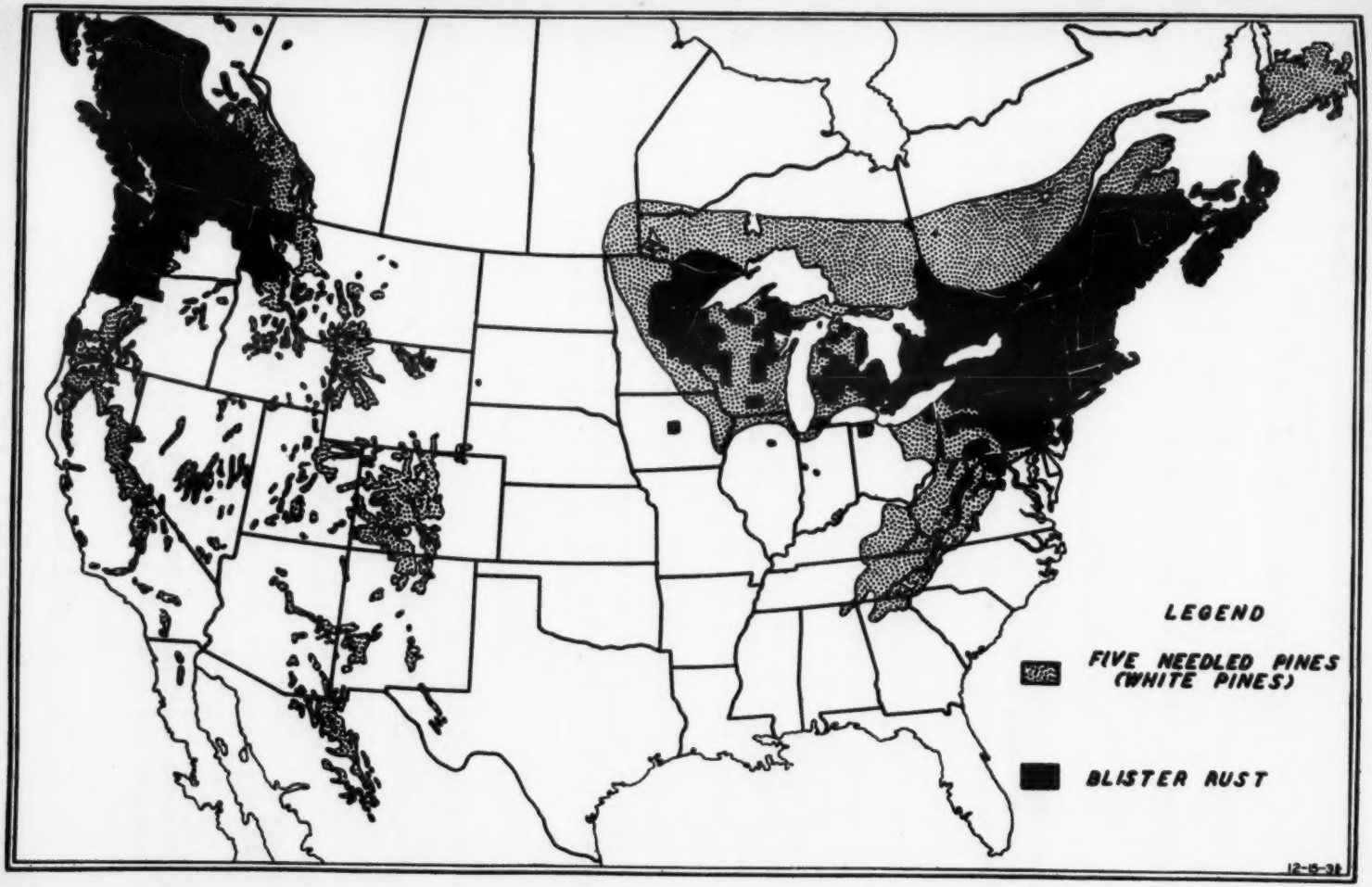

Fig. 22. Range of white pines and distribution of blister rust (Cronartium ribicola) in North America, 1951. Counties in which blister rust has been found on Ribes or pines or on both host plants in one or more places are shown in solid black.

It was very abundant in New York and was noted as present in New Jersey, Missouri, and Texas.

D O G W O O D (CORNUS FLORIDA)

TWIG DIE BACK (Cryptostictus sp. (?)). In New Jersey large numbers of young dogwood were ruined for shade purposes due to the center branches being killed. A number of trees were completely killed. Cryptostictus sp. was suspected.

H A W T H O R N (CRATAEGUS SPP.)

BLIGHT (Bacillus amylovorus). In New Jersey blight often caused severe injury to ornamental hawthorn. Poole reported both spur and twig blight abundant in North Carolina but observed "Plants, even ornamentals, are more resistant than apples and pears."

B L A C K W A L N U T (JUGLANS NIGRA)

CANKER (Nectria sp.). West Virginia reported this disease in occasional plantings with maximum infection of 85 per cent observed, with the comment "Localized, presumably, because of special ecological conditions." Orton also notes that the black walnut canker is known to be present in 27 counties in West Virginia and in the States of Rhode Island, Pennsylvania, Virginia, Wisconsin, Tennessee, and North Carolina; and in Ontario, Canada.

S Y C A M O R E (PLATANUS SP.)

ANTHRACNOSE (Gnomonia veneta) was reported from Massachusetts, New York, Connecticut, New Jersey, Ohio, Indiana, Kansas, and Arkansas. Arkansas and Indiana noted much more than last year.

P O P L A R (POPULUS SPP.)

CANKERS due to Cytospora chrysosperma or Dothichiza populea were reported from Massachusetts, New York, New Jersey, North Carolina, Missouri, Wisconsin, and Nebraska. Massachusetts and Missouri reported more than in previous years.

O A K (QUERCUS SPP.)

ROOT ROT (Armillaria mellea). The frequent occurrance of Armillaria root rot and its importance in association with the drought of 1930 was noted in North Carolina, Wisconsin, and West Virginia.

ANTHRACNOSE (Gnomonia veneta) was reported from Massachusetts, New York, New Jersey, Delaware, and Wisconsin. Wisconsin and Delaware reported more than last year.

W I L L O W (SALIX SPP.)

SCAB (Fusicladium saliciperdum) reported from Massachusetts and Connecticut as more abundant than last year or an average year. In Massachusetts severe damage occurred in Berkshire County. In one area 18 per cent, by actual count, of the leaves were infected. See P.D.R. 15: 70.

E L M (ULMUS SPP.)

ANTHRACNOSE (Gnomonia ulmea) reported from Massachusetts, Connecticut, New Jersey, Ohio, Missouri, Oklahoma (P. D. R. 15: 57), and Texas (P. D. R. 15: 70). Massachusetts, Connecticut, and Missouri indicated more than last year. Maximum loss of 40 per cent was noted in one place in Missouri.

DUTCH ELM DISEASE (Graphium ulmi). Four cases were discovered at Cleveland, Ohio, in addition to the three reported there in 1930 and the one in Cincinnati in 1930. Although 600 suspected specimens were cultrued no other infected trees were found.

D I S E A S E S O F O R N A M E N T A L S

H O L L Y H O C K (ALTHAEA ROSEA)

STEM ROT (Sclerotinia libertiana) is reported by P. A. Young from Montana. He notes that both stems and roots are badly affected by this fungus, which produces symptoms almost identical with those which this fungus causes in sunflower. For a description of the disease on sunflower see Montana Agr. Exp. Sta. Bul. 208. 1927.

S N A P D R A G O N (ANTIRRHINUM MAJUS)

RUST (Puccinia antirrhini) reported from Connecticut, New York (less than usual), New Jersey (scattered), West Virginia, North Carolina (very abundant), Texas (10 per cent loss), Ohio (same as usual), Michigan ("On outdoor plantings rust appeared too late in the season to cause any marked damage. Well controlled in most greenhouses by careful watering."), Wisconsin (same as last year, less than usual), Minnesota, Missouri ("Found to be serious in greenhouses. Very little in outdoor plantings."), Nebraska, Kansas ("In some cases 50 per cent destructive."), and Washington.

A S T E R (CALLISTEPHUS CHINENSIS)

RUST (Coleosporium solidaginis). New York "Aster rust more prevalent and serious than usual this year. Shade grown asters just as seriously affected as those grown out in the open." Wisconsin, "Of more importance than usual but came too late to be of commercial importance. Most of the asters had been harvested." Reported also from Missouri.

WILT (Fusarium conglutinans callistephi), Connecticut (more than usual), New York (more than usual), New Jersey, "Locally severe, some gardens losing a high percentage of plants," Indiana, "Occurred in plats at Lafayette. The Horticultural Department has resistant strains," Michigan, "Ten per cent loss. A very troublesome disease everywhere but readily prevented by intelligent growers," Wisconsin, "More than usual. The Department's selection continued to improve in type and resistance." Present in Ohio, Missouri, and Washington.

YELLOWS (virus). Massachusetts "More important than usual, 30 per cent loss in gardens and flower beds. Very few succeeded in obtaining blossoms worth while." New York, "Very important, about the same amount as usual.

Several florists in the State obtained 100 per cent control by growing asters in insect-proof tents." New Jersey, "General and the cause of general disappointment", Ohio and Kansas, about the same as usual, Michigan, "Continues to be the most destructive disease of ornamentals," Wisconsin, "About the same as usual. Asters grown under cloth shade proved very satisfactory."

S W E E T W I L L I A M (DIANTHUS BARBATUS)

STEM AND PLANT ROT (Sclerotium rolfsii) was general in the eastern part of North Carolina with a 70 per cent reduction in yield. One of the most destructive pests of the crop. From 75 to 90 per cent of the plants in the city of Raleigh destroyed by this disease. Both old and new plants attacked. New plants developed from seed in the summer mostly destroyed.

C A R N A T I O N (DIANTHUS CARYOPHYLLUS)

LEAF SPOT (Alternaria sp.) reported from Indiana, "Very common this year, one florist had a $10,000 loss from this disease." Michigan, "Twenty per cent loss. Observed for the first time as a serious disease of lining-out stock and also mature plants." Also reported from Connecticut, New York, and New Jersey.

ROOT KNOT (Caconema radicicola). North Carolina, "Severe losses observed in greenhouses where old and infected soil had been used for several years. The plants were stunted and unprofitable."

G L A D I O L U S (GLADIOLUS SP.)

SCAB (Bacterium marginatum). Massachusetts, "More than usual. Both the neck rot and corm spot stages were observed generally. Severe losses to corms in some cases." Michigan, "Less than usual. High temperature and dry soil unfavorable for scab this year." More than usual in New Jersey and Nebraska. Noted in New York, Ohio, Florida, and Texas.

HARD ROT (Septoria gladioli). Wisconsin, "About the same amount as an average year. Corm selection more important than treatment. Biggest factor in control is in raising clean bulblets." New Jersey, "About the same as usual. The importance of this disease is being eclipsed by the increasing importance of scab." Noted in Ohio.

DRY ROT (Sclerotium gladioli). Michigan, "Less than usual. No reports of dry rot for the first time in several years."

I R I S (IRIS SP.)

LEAF SPOT (Didymellina iridis). New York, "This disease was serious again this year despite the dry weather in certain parts of the State." Michigan, "Initial infections from ascospores noted early in May. The disease developed rapidly thereafter and caused a marked decrease in vegetative vigor." Kansas, less than usual, general in the eastern part of the State. Texas, "Exceedingly common, affecting vigor of plants and blooming habits." Wisconsin, more than last year or an average year. Same as

last year in Massachusetts, New York, and Ohio. Noted in Connecticut, New Jersey, Indiana, and North Carolina.

S W E E T P E A (LATHYRUS ODORATUS)

ROOT KNOT (Caconema radicicola). New York, "Two large greenhouses planted to sweet peas were a total loss as a result of this pest."

N A R C I S S U S (NARCISSUS SP.)

BULB ROT (Fusarium sp.). Massachusetts, "Attention was recently called to almost total loss of a shipment of narcissus due to a Fusarium bulb-rot. The bulbs were shipped to this State last August from Long Island. The grower stated that the bulbs appeared sound when he received them."

P E O N Y (PAEONIA SP.)

BLIGHT (Botrytis sp.) noted from Connecticut, New Jersey, New York, Ohio, Michigan, Wisconsin, Minnesota, Arkansas, and Washington. All these States reported the same as or less than the previous year except Connecticut which reported more than last year but the same as usual.

ROOT KNOT (Caconema radicicola). "Steadily on the increase in southern Michigan. Eighty per cent control by treating infested roots for 30 minutes in water at a temperature of 120° F."

P H L O X (PHLOX SPP.)

MILDEW (Erysiphe cichoracearum). Virginia. P. D. R. 15: 103.

LEAF SPOT (Septoria divaricata). Michigan, "The most common disease affecting this plant with the exception of powdery mildew. Defoliation is a common effect of the disease."

R O S E (ROSA SPP.)

BLACK SPOT (Diplocarpon rosae). In Massachusetts and Connecticut more than last year, same as average year. New York and New Jersey, same as last year, same as average year. New York, "Black spot was prevalent again on both garden and greenhouse roses." New Jersey, "As usual this is the most prevalent and most severe disease of roses in this State. Unsprayed or undusted gardens and fields showed severe defoliation by the middle of August." North Carolina, "Common, caused some defoliation of such varieties as Dr. Van Fleet, usually very resistant. Bush roses badly attacked." Georgia, "All leaves on bush roses heavily infected." Texas, "Common, particularly on old plantings." Arkansas, much more than last year and more than average year. "No varieties showed marked resistance this year. Even rugosas, hybrid perpetual, and climbers showed considerable black spot." Indiana, "Very common, but not usually injurious to the crop." Michigan, "Dry season unfavorable for black spot on outdoor roses. In greenhouses prevalent as usual." Wisconsin, same as last year and less than average year. "Sulphur and arsenate dusts gave good control." Missouri, "Very severe in greenhouses." Colorado, general, less than last year and less than average

year. "Use of wettable sulphur found very effective." New York, Ohio, Louisiana, and Kansas same as last year and same as average year. Also reported from South Carolina.

POWDERY MILDEW (Sphaerotheca pannosa). New York, less than usual and less than last year. Delaware, much more than last year and much more than an average year. Michigan, "Developed rapidly in September and October. Minor importance previously." Wisconsin, "Observed only where air drainage conditions were poor. Controlled by dusting." Minnesota, "Heavy infection on climbers noted during June." Missouri, "Serious in greenhouses." Georgia, "Leaves, young stems, and buds covered and dying." Arkansas, more than usual, more than last year. "Dusting with sulphur has not given good control this year." Texas, "Very common and prevalent." Ohio and Colorado, same as usual. "Use of wettable sulphur found very effective." Reported from Connecticut, New Jersey, Kansas, and Nebraska.

CROWN CANKER (Cylindrocladium scoparium). New York, "A few cases observed where this disease resulted in serious losses in greenhouse roses." New Jersey, "This disease apparently on increase in rose houses of this State. Certain varieties are killed, due to complete cessation of root growth. Plants wilt, show marginal leaf browning and yellow leaves."

CROWN GALL (Bacterium tumefaciens). North Carolina, "Common and destructive on greenhouse roses." Wisconsin, "Much more than last year. Seems to come from lack of rotation or slight infection of plant sets." Missouri, scattered. Connecticut, Ohio, and Kansas same as last year and same as an average year.

L I L A C (SYRINGA SP.)

POWDERY MILDEW (Microsphaera alni). Noted from Connecticut, New York, and Missouri, same as last year. North Carolina, "Abundant, causing defoliation in moist locations." Texas, trace. Kansas, less than last year.

T U L I P (TULIPA SP.)

BOTRYTIS BLIGHT (Botrytis tulipae). Michigan, "Everywhere present in old plantings and extremely destructive." New York, more than last year and same as an average year. New Jersey and Delaware, scattered. Ohio, same as last year. Arkansas, noted at Little Rock.

Z I N N I A (ZINNIA ELEGANS)

POWDERY MILDEW (Erysiphe cichoracearum). Michigan, "General but damage slight on account of delayed appearance. Arizona "Reported to be very bad this year. Estimates show 30 per cent loss." Texas, very common. Reported from Connecticut, New Jersey, Missouri, and Kansas.

DISEASES OF FRUIT AND NUT CROPS

APPLE

SCAB (Venturia inaequalis) was generally somewhat more severe than in 1930. The highest loss was reported from Massachusetts where 12 per cent was estimated for the State. The average loss for the twelve States reporting was 4.5 per cent. This disease was more prevalent in Maine, Massachusetts, Virginia, Arkansas, Michigan, and Missouri than during previous years, apparently due to the unusually favorable weather conditions for infection. (P. D. R. 49, 56, 66, 89, 99, 100, and 119). There were several good infection periods, which extended the time for the discharge of ascospores longer than the average year, but where the spray schedule was carried out the disease was controlled fairly well. The drouth seemed to reduce the amount of scab in Pennsylvania and Montana. (P. D. R. 15: 34, 150).

BLOTCH (Phyllosticta solitaria). The severity of blotch was apparently about that of an average year. Three States, New Jersey, Delaware, and Virginia, reported more than usual. Maryland, Wisconsin, and Missouri estimated less and Kansas, Ohio, Arkansas, North Carolina, and West Virginia report an average year. The highest loss for any State reported was 2 per cent from Missouri. One orchard in North Carolina was 100 per cent infected. Gardner in Indiana reports good control with Bordeaux mixture spray, but failure with dry lime sulphur.

BLIGHT (Bacillus amylovorus) was less prevalent than last year, and probably less so than an average year. Of the nineteen collaborators reporting its relative importance, 8 reported an average year, 5 less than an average year, 2 much less, 3 more, and only one State, Virginia, reports much more. North Carolina and Missouri reported the heaviest losses, each estimating the loss at 5 per cent. The growers of Kentucky are impressed with the value of the weak Bordeaux sprays applied during the blossoming period. Wisconsin also advocates the application of weak Bordeaux. Blossom blight was severe in a few scattered orchards in Michigan. The limited area of infection was probably due to the small number of holdover cankers formed on account of dry weather in 1930. P. D. R. 15: 67, 89, 99.

BITTER ROT (Glomerella cingulata) was considerably more prevalent than in 1930, as indicated by the fact that ten of the eleven States reporting estimated more loss. Losses up to 100 per cent occurred on the Mother variety in small areas in numerous orchards of Virginia. North Carolina reported an average loss of 4 per cent, and a single orchard having 15 per cent infection, whereas Ohio, Missouri, and Maryland report 2, 1.5, and 1.5 per cent losses, respectively. Other States note losses of a trace to 1 per cent. Trees which had been sprayed with sulphur showed 50 per cent loss in several cases in New Jersey. In Kentucky, bitter rot became severe during a warm humid period in September, and continued to develop in storage.

APPLE RUST (Gymnosporangium juniperi-virginianae). There was generally less apple rust than in an average year, however, South Dakota reported a total loss of 4 per cent, Missouri a 5 per cent infection in one orchard, North Carolina suffered heavy infection in orchards near cedars, but very

slight infection of fruit, even where leaf infection was abundant. Cedar eradication in West Virginia has reduced losses to a point where they are relatively of slight importance according to Orton.

W. D. Mills of New York reports telial horns one-half inch long, April 25, one inch long, April 26, and two inches long, May 8. The first sporidia were found May 8 to 9, and the first lesions on Winter Banana were observed on May 26. Only a few gelatinous horns were left during the rain of June 16. Further notes on spore horn protrusions are included in P. D. R. 15: 49 for Virginia, and 89 for Minnesota.

QUINCE RUST (Gymnosporangium germinale) was reported from three States. The major alternate host for quince rust in Maine appears to be Juniperus communis var. depressa. In this State quince rust occurred on Delicious, Winter Banana, Wealthy, Baldwin, Tolman Sweet, Bellflowers, and McIntosh. There was more in New York than 1930, with a maximum infection of 4.4 per cent on Rome in one orchard. Indiana reports Delicious, Winesap, and Stayman as being infected..

HAWTHORN RUST (Gymnosporangium globosum) occurred on the Baldwin variety and one unknown variety in Maine. It was noted also in New York.

POWDERY MILDEW (Podosphaera leucotricha) was severe on new growth of the Rome variety in New Jersey. It was controlled by collodial sulfur and lime sulfur. P. D. R. 15: 67, 99.

BLACK ROT (Physalospora malorum). Of the nineteen States reporting this disease, Massachusetts, New York, Virginia, and West Virginia reported more than an average year; Delaware, Maryland, Indiana, Wisconsin, and Missouri less; and the other States the usual amount. The heaviest losses reported were 4 per cent and 2 per cent from Maryland and Virginia, respectively. Abundant twig infection occurred in New Jersey orchards where blight was present the previous year. Virginia reported an unusual amount of calyx-end infection in August. In West Virginia the greatest loss occurred where the disease followed insect injury, especially codling moth. Blossom-end rot was worse than usual in Kentucky, perhaps due to more thorough codling moth spray and consequent spray injury. The leaf spot (frog eye) was abundant in North Carolina, due to the large amount of inoculum carried over on blighted twigs killed by Bacillus amylovorus. Black rot was noticeable in nursery stock in Wisconsin, where as many trees had to be discarded from it as from callus gall.

BLISTER CANKER (Nummularia discreta) was found quite generally in old Ben Davis plantings and apparently had caused the death of a considerable number of trees in Virginia. West Virginia and Arkansas also reported severe losses due to blister canker on the Ben Davis variety. In Missouri the loss was estimated at 2.3 per cent.

CROWN GALL (Bacterium tumefaciens) caused a 5 per cent loss in Texas. Wisconsin reported 1 per cent loss in nursery stock. Missouri and Kansas noted small losses on nursery stock.

SOOTY BLOTCH (Gloeodes pomigena). New Jersey, West Virginia, Virginia, North Carolina, and Indiana reported sooty blotch as being present in serious amounts where spray applications were omitted. Massachusetts, Connecticut, Maryland, and Missouri also reported its presence.

FLYSPECK (Leptothyrium pomi) was more generally present this season than usual in Virginia. It was observed in New Jersey, Maryland, North Carolina, Arkansas, Wisconsin, and New York.

FRUIT SPOT (Phoma pomi) damaged as high as 95 per cent of the fruit of Rome when lime sulphur or other sulphur fungicides were used, in New Jersey. It was present on Baldwin, Wealthy, Spy, and McIntosh in Massachusetts, where favorable weather prevailed (rainy and cool). Stayman, Black Ben Davis, and Limbertwig were severely infected in the mountain areas of North Carolina. Other States reporting it are New York, Maryland, Ohio, and Missouri.

BITTER PIT (non-par.) caused 5 per cent loss, and a maximum spotting in some orchards of 100 per cent in North Carolina. Trees heavily loaded were especially affected and the varieties Stayman, York, and Grimes seemed to suffer most. West Virginia reported 2 per cent loss on York, King David, Stayman, Grimes, Stark, and Ben Davis. The collaborators of these two States think that the drought conditions of 1929 and 1930 probably played some part in the severity of bitter pit. It was reported as common and severe in all parts of New Jersey. Also reported from Massachusetts, Connecticut, New York, Maryland, Michigan, and Washington.

DROUGHT AND FROST caused a 50 per cent reduction in yield in South Dakota due to an early frost and a severe drought during midsummer. (P. D. R. 15: 151).

SPRAY INJURY. 1931 seems to have been an unusual year as regards spray injury. Delaware experienced some arsenical foliage injury where excess lime was not used. Considerable injury was reported from New York on fruit and foliage from the use of copper dusts. New Jersey reported severe leaf injury occurring in late summer from the use of sulfur and other cases due to lead arsenate. West Virginia reported spray injuries as becoming increasingly important because apple growers are applying more spray material, particularly arsenate of lead, during the early season. The following account was taken from C. L. Burkholder's notes on spray burn of apple foliage in 1931. (Hoosier Hort. 14: 20-24, 1932):

"The first serious appearance of leaf burn began to show up a few days after the first spray application for second brood codling moth. The next lead and lime spray the middle of July caused more serious burns. Varieties such as Grimes, Jonathan and Ben Davis were most seriously affected and in many cases dropped 50 per cent of their leaves by September 1. The most serious leaf drop occurred in a band eight to ten feet high around the bottom of the tree, and this was followed by a premature ripening and drop of fruit in that area of the tree. This seemed to indicate that burning was most severe in that part of the tree which would naturally receive the heaviest coverage of spray material. It seems to be generally agreed among the pathologists that the injuries received were probably due to insufficient

lime, thus causing carbonation which causes the production of a large amount of soluble arsenic. The excess arsenical injury of 1931 may also be due to the weakened condition of the trees brought about by the drought of previous seasons."

P E A R

BLIGHT (Bacillus amylovorus) apparently was less severe than in an average year, as indicated by the estimates of loss by the collaborators. Of the thirteen reporting, only two estimate more than a usual year, namely, Virginia (15 per cent) and Missouri (12 per cent). Blight is rather sporadic in occurrence. It was severe in some orchards in Arkansas while entirely absent in others. In contrast to the outbreak in California in 1930, there was a marked decrease in 1931. For the year 1930 it generally seemed to be more prevalent in the same area on apples than pears, while in 1929 the reverse was true. For 1931, Virginia reported a loss of 15 per cent as contrasted with a trace in West Virginia. P. D. R. 15: 67, 89, 99.

SCAB (Venturia pyrina) caused 5, 3.5, and 3 per cent losses, respectively, in Maryland, Wisconsin, and Ohio. A trace was reported from Virginia, West Virginia, Michigan, Massachusetts, and Missouri. One hundred per cent fruit infection was noted in Flemish Beauty orchards in New York. P. D. R. 15: 100.

LEAF BLIGHT (Fabraea maculata) was relatively unimportant. The greatest losses were reported in Maryland (4 per cent) and Delaware (2 per cent). Michigan, Missouri, Virginia, and West Virginia reported a trace loss.

SOOTY BLOTCH (Gloeodes pomigena) was severe locally in New York.

FRUIT ROTS. Pears did not keep well in Massachusetts. Several diseases developed late in the season. Among the principle organisms involved were Botrytis cinerea, Cephalothecium roseum, Gloeosporium rufomaculans (=Glomerella cingulata), and Physalospora malorum. P. D. R. 15: 27-28.

Q U I N C E

RUST (Gymnosporangium germinale) seemed to be more prevalent than usual. Its presence was reported in Massachusetts, Connecticut, New York, Michigan, and Nebraska.

P E A C H

BROWN ROT (Sclerotinia fructicola). Six States reported more, seven less, and three the same amount as previous years. States reporting more than 1 per cent loss were Massachusetts, 10 per cent; Ohio and North Carolina, 5; Maryland, 4; and Missouri, Delaware, Virginia, West Virginia, Kentucky and Texas, all 2 per cent. There was comparatively little rot in Kentucky, Indiana, and Michigan on Elbertas this season as it was dry at picking time. Rains just before and during harvest in North Carolina resulted in more severe brown rot losses than at any time during the past 5 years, in late varieties (Elberta and Hale).

LEAF CURL (Exascus deformans). Of the 15 States reporting on this disease nine, Massachusetts, New York, Delaware, Kentucky, North Carolina, Georgia, Louisiana, Ohio, and Indiana indicated either more or much more than usual, and it was generally more prevalent than last year. In Delaware, where 100 per cent infection occurred on unsprayed trees, this is the first serious outbreak for three years. North Carolina reported heavy defoliation in the Piedmont and mountain area, and also considerable fruit injury resulting from late infections. Leaf curl appeared in epidemic form in northern Louisiana in April, which was very unusual for that State. Apparently either late sprayed or unsprayed orchards were the only ones that were severely damaged by this disease. P. D. R. 15: 35, 54, 55, 100.

BACTERIAL SPOT (Bacterium pruni). Indiana, North Carolina, Missouri, Maryland, and Texas, reported 10, 5, 2, 1.5, and 1 per cent losses, respectively, which are somewhat greater than occur during an average year and considerably more than last year. The varieties Elberta and Hale were generally reported as very susceptible. P. D. R. 15: 55.

SCAB (Cladosporium carpophilum). The States reporting more than 1 per cent loss were Florida, Delaware, Texas, West Virginia, and Kentucky which estimated 15, 5, 3, 3, and 2 per cent losses, respectively. Delaware reports this year as being the first since 1923 in which this disease was prevalent.

BLIGHT (Coryneum beijerinckii). Serious locally in Michigan. P. D. R. 15: 100.

CROWN GALL (Bacterium tumefaciens). The actual number of trees killed in North Carolina was very great. Entire orchards were probably killed by this disease in the sand hill area. It is reported as being severe in young stock, especially in nurseries in Missouri.

ROOT ROT (Armillaria mellea) is very abundant, causing severe die back and eventually death of trees, in North Carolina.

DIE BACK (Valsa leucostoma) caused a trace loss in North Carolina, Texas, and Missouri. It is particularly severe on trees with impaired vigor due to drought or winter-injury.

YELLOWS (Virus). Five States reported the presence of this disease, but the losses were under 1 per cent. P. D. R. 15: 34, 99.

LITTLE PEACH (Virus) reported from New York, New Jersey, Virginia, and Michigan. P. D. R. 15: 34.

RED SUTURE (Virus) was serious in four counties in Michigan. Twenty per cent of the trees in a well managed orchard showed symptoms. It has been shown that this disease can be reproduced by budding.

PHONY PEACH (Virus). A detailed account of the distribution of phony peach will be given in the 1932 annual summary.

ARSENICAL INJURY. Several severe cases of defoliation adjacent to 85-15 dusted apple orchards were noted in New York. Virginia and North Carolina experienced severe arsenical burning on foliage and fruit when zinc lime was not used in all lead arsenate applications. Defoliation of 5 to 35 per cent resulted from arsenical spray injury in Indiana.

P L U M

BROWN ROT (Sclerotinia fructicola) was generally more severe than an average year. Some of the heaviest losses occurred in Massachusetts, 20 per cent; Ohio, 12 per cent; Michigan, 10 per cent; Missouri and Maryland, each 5 per cent. Cases of 50 per cent infection were noted in Michigan, when it followed curculio infestation. P. D. R. 15: 101.

CROWN GALL (Bacterium tumefaciens) killed over 200 trees in one orchard in Arizona. P. D. R. 15: 67.

PLUM POCKETS (Exoascus pruni). Louisiana reports more of this disease than usual, causing especially an enlargement of the buds which dried later. It was unusually severe in Iowa, causing greatly enlarged fruits. P. D. R. 15: 100, 104.

DECAY (Penicillium sp., Cladosporium sp.). Italian prunes from the Northwest.

C H E R R Y

BROWN ROT (Sclerotinia fructicola) was probably a little less severe than in the average year, although losses to the extent of 10, 5, 4, and 2 per cent for North Carolina, Virginia, Massachusetts, and Texas, respectively, were reported. P. D. R. 15: 50, 73, 74.

LEAF SPOT (Coccomyces hiemalis) was about equal in importance to previous years in most States reporting. Massachusetts, New Jersey, Delaware, and Michigan reported severe defoliation. Wisconsin reported satisfactory control with either lime sulfur or Bordeaux.

DECAY of sweet cherries from California, due to various fungi, including Aspergillus sp., Botrytis sp., Cladosporium sp., Alternaria sp., Penicillium sp., Rhizopus sp., P. D. R. 15: 73, 74. Cladosporium sp. and other organisms also occurred on sweet cherries from Idaho, Washington, and Oregon, following cracking.

CRACKING (apparently water relationship). Idaho, Washington, and Oregon. P. D. R. 15: 102.

FROST INJURY. A 75 per cent reduction in yield occurred in Massachusetts. P. D. R. 15: 56.

G R A P E

BLACK ROT (Guignardia bidwellii) was somewhat more severe generally than an average year, and considerably more prevalent than last year as evidenced

by the fact that 10 of the 15 States considering its prevalence reported more or much more. Those States reporting more than 3 per cent loss were: Massachusetts (20), North Carolina (10), Florida, Texas, and Virginia (5 each), Maryland and Kentucky (4 each). Virginia reported the loss of the entire crop of a 15-acre vineyard which was sprayed with Bordeaux, but in which the spray was applied with a gun instead of a nozzle. Arkansas, Michigan, Minnesota, and Kansas reported no loss due to unfavorable conditions for the development of black rot . P. D. R. 15: 56.

DOWNY MILDEW (Plasmopara viticola) was very severe in Virginia, causing a 10 per cent reduction in yield. Severity was apparently due to favorable weather conditions (rainy and high temperature). Other States reported nothing of outstanding interest.

RIPE ROT (Glomerella cingulata). Massachusetts reported an 8 per cent reduction in yield from this disease. The symptoms were not typical, in that the infected grapes kept their form, there was no wrinkling, the fibrovascular bundles of the pulp turned black, and the fruit dropped prematurely. Ohio also reported this disease as being prevalent.

ROOT KNOT (Caconema radicicola). Arizona. P. D. R. 15: 148.

S T R A W B E R R Y

LEAF SPOT (Mycosphaerella fragariae) was generally about as prevalent as in an average year. Louisiana reports 15 per cent reduction in yield, but good control was obtained by winter spraying with 4-4-50 Bordeaux.

SCORCH (Diplocarpon earliana). Louisiana, less important than leaf spot; North Carolina, slight injury. P. D. R. 15: 66, 149.

ROOT ROT (Armillaria mellea). Although this seemed to be quite prevalent throughout the strawberry growing region, Massachusetts with 5 per cent reduction in yield gave the only loss estimate. P. D. R. 15: 24, 66.

BERRY ROTS: Some of the heaviest reductions in yields reported are as follows: Botrytis cinerea, Massachusetts 8 per cent, Missouri 5 per cent. Rhizopus nigricans, Missouri 12 per cent. P. D. R. 27, 28, 50, 65, 66.

DWARF (Aphelenchoides fragariae). The reports regarding strawberry dwarf, including the results of a special survey during the summer of 1931, are noted in P. D. R. 15: 60, 66, 147, and 149, and summarized with a map in the Journal of Economic Entomology, Vol. 25, No. 3, p. 450, June, 1932.

R A S P B E R R Y

ANTHRACNOSE (Plectodiscella veneta) was generally more severe than usual and caused somewhat heavier losses than last year. The losses estimated by collaborators are expressed in percentage: Virginia 10, Missouri 6, Michigan 5, Maryland 4, and Massachusetts 1. This disease is a limiting factor in many plantings in Arkansas. Maximum infections of 75 and 100 per cent were reported from Michigan and Missouri respectively.

MOSAIC (Virus) appeared to be somewhat less prevalent than last year and less severe than an average year, although the following losses were reported: Massachusetts 20 per cent; Michigan 5, and Minnesota 4. Michigan and Wisconsin report beneficial effects from roguing.

LEAF RUST (Pucciniastrum americanum). New York. P. D. R. 15: 135-136.

CANE BLIGHT (Leptosphaeria coniothyrium) 10 and 4 per cent losses were reported from Massachusetts and Maryland, respectively.

VERTICILLIUM WILT (Verticillium sp.). Pennsylvania. P. D. R. 15: 150.

SPUR DROP (undet.). Kentucky. P. D. R. 15: 55.

B L A C K B E R R Y

ORANGE RUST (Kuehneola nitens) caused appreciable loss in many plantings in Arkansas. P. D. R. 15: 56.

FRUIT ROT (Botrytis vulgaris). Massachusetts reports a 5 per cent reduction in yield.

D E W B E R R Y

ANTHRACNOSE (Plectodiscella veneta) caused 20 per cent loss in North Carolina and was severe in New Jersey.

VIOLET ROOT ROT (Rhizoctonia crocorum). North Carolina. P. D. R. 15: 89.

C U R R A N T

POWDERY MILDEW (Sphaerotheca mors-uvae). Severe locally in Washington. P. D. R. 15: 56.

ANTHRACNOSE (Pseudopeziza ribis) caused heavy defoliation in Wisconsin.

C R A N B E R R Y

FRUIT ROTS. Massachusetts, which produces about two-thirds of the cranberry crop of the United States, suffered the worst outbreak of cranberry fruit rots during the past 20 years, perhaps the worst in the history of the industry. In spite of the fact that the condition of the crop was accurately forecast early in September, and in spite of all the efforts of a highly organized industry to reduce the amount of rot, it is conservatively estimated that one-fourth of the berries produced in Massachusetts decayed before they were sold to the ultimate consumer. A summary of notable outbreaks of cranberry fruit rot in Massachusetts so far as they are recorded is given in Phytopathology 22: 911-916. (1932).

FALSE BLOSSOM (virus) as reported in P. D. R. 15: page 25, seems not to spread on the Pacific Coast but to be spreading rapidly in certain Wisconsin bogs in which it has been introduced during the last 10 years. In

Massachusetts the progress of the disease has apparently been slowed down perhaps due to active measures for the control of the insect carrier.

New Jersey, on the other hand, is now feeling the full force of this, the most serious disease which has been known to attack cranberries. R. B. Wilcox has recently prepared a series of graphs showing the total yield for the State and the yield of the more important varieties in New Jersey for the period 1913 to 1929. These curves, shown in Fig. 23, are expressed in terms of percentage of the highest yield, which in most cases was in 1923. The curve is smoothed by considering the yield for each year as the average of that particular year, of the two preceding and the two following years. It will be noted that the decline in yield since 1923 amounted to 33 per cent, when all varieties are averaged together, 16 per cent in the case of Early Black, 33 per cent for Howes, 32 per cent for Champion, 44 per cent for "Native Jersey," and 56 per cent for Centennial. The rate of decline indicated agrees closely with the susceptibility of the different varieties to the false blossom disease as observed in field studies and by actual tests.

M U L B E R R Y

BACTERIAL BLIGHT (Bacterium mori). Texas. P. D. R. 15: 67.

POPCORN DISEASE (Sclerotinia carunculoides). Texas, Georgia. P. D. R. 15: 68, 101.

C I T R U S

SCAB (Sphaceloma fawcettii) caused 50 per cent loss on lemons, 25 to 50 per cent on Tangelos, and 3 per cent on grapefruit in Florida.

FRUIT ROTS. BLACK MOLD ROT (Aspergillus niger) and ALTERNARIA ROT (Alternaria sp.), California. P. D. R. 15: 133.

FRUIT SPOTS (Alternaria sp. and Colletotrichum sp.). California. P. D. R. 15: 161.

F I G

DIE BACK (Diplodia sycina syconophila) was very abundant on trees dying from nematode infestation and winter injury in North Carolina.

ROOT KNOT (Caconema radicicola) very severe in North Carolina; a trace in Texas.

P E R S I M M O N

FRUIT ROT (Sphaeropsis malorum) was reported from Georgia.

P E C A N

LEAF SPOT (Cercospora fusca) was very abundant in North Carolina.

Fig. 23. Recent decline in cranberry yields in New Jersey believed to be due chiefly to False Blossom. Yields expressed in terms of percentage reduction from the highest yield for each variety. The highest yields were in 1923, except 1925 for Champion, and 1921 for Centennial.

SCAB (Cladosporium effusum) caused 5 per cent loss in North Carolina with as high as 100 per cent infection in some cases. P. D. R. 15: 136.

CROWN GALL (Bacterium tumefaciens). Arizona. P. D. R. 15: 67.

KERNEL SPOT due to stink bug punctures was unusually severe in North Carolina, Arkansas, and Texas where 10, 20 to 50, and 8 per cent losses, respectively, were reported.

NEMATODE DISEASES

Two nematode diseases attracted unusual attention during the year; the brown ring disease of sweet potato (P. D. R. 41) caused by Tylenchus dipsaci, which was noted again in New Jersey, and strawberry dwarf caused by Aphelenchoides fragariae, which has long been established throughout the southeastern States and is now found in one or two more northern localities. There has also been an unusual number of reports of root knot due to Caconema radicicola in the United States. In this case, it is particularly difficult to determine whether the increase is an actual one or if the greater number of reports is due to an increased interest in nematode diseases. An interesting possibility is that abnormally warm winters of the past few years may have permitted the building up of an unusually large nematode population in the northeastern United States.

For detailed reports on nematode diseases see the various hosts and the index.

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